Alberta
EDUCATION

Devonian Building, West Tower, 11160 Jasper Avenue, Edmonton, Alberta, Canada T5K 0L2

May, 1983

TO THE READER:

Energy Conservation: Phase 2, Field Projects
External Evaluation

We are pleased to forward to you a copy of the evaluation of Phase 2 of Alberta Education's Energy Conservation Project. You may know, Phase 3 of the project - province-wide program implementation - announced in July, 1982, is currently underway.

Two separate evaluations of Phase 2 (field projects) of the project were conducted: the external evaluation (Stanley Associates report, enclosed), which focussed on the more qualitative aspects of the program, e.g. curriculum, motivation, perceptions and attitudes; and an internal evaluation concentrating on the more technical components of the program, undertaken by the Project Team (D. Sundmark, Project Director) itself.

Copies of the Summary of the internal evaluation will be forthcoming shortly through the Planning Services Branch. As well, limited numbers of the full internal evaluation report will be available to you on request.

Yours sincerely,

H. I. Hastings

H. I. Hastings
Director
Planning Services Branch

ALBERTA EDUCATION

ENERGY CONSERVATION PROJECT

PHASE 2: EXTERNAL EVALUATION

DOCUMENT 1: REPORT

STANLEY ASSOCIATES ENGINEERING LTD.

Under Contract To

ALBERTA EDUCATION

EDMONTON, ALBERTA

NOVEMBER 1982

Stanley

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LETTER OF TRANSMITTAL

12 October 1982
File: 58-2159-3-1-1

Mr. Ray LaFleur, Planning Consultant
Planning and Research Branch
Alberta Education
9th Floor, West Tower
Devonian Building
11160 - Jasper Avenue
Edmonton, AB T5K 0L2

Dear Mr. LaFleur:

Reference: Energy Conservation Field Projects, Phase 2 Evaluation Report

The pleasure is ours to enclose the final report regarding the Energy Conservation Field Project, Phase 2 Evaluation. Our research has concluded that the technical field projects were successful, based on the opinions of the recipients and the suppliers of the services delivered. Some adjustments should be entertained should Alberta Education wish to extend the nature of the energy conservation services beyond the second phase of the field projects.

The attached material has been published in two documents and they are:

(i) Document I: Report; and,
(ii) Document II: Appendices

We have enjoyed working with the Steering Committee and acknowledge their acceptance of the enclosed material.

Yours truly,

STANLEY ASSOCIATES ENGINEERING LTD.

Robert D. Fiedler, B.Des. e.p.
Project Planner

David A. Kinnaird

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Project Manager

DAK/llg

cc. Dr. Warren Hathaway
School Buildings Branch

ACKNOWLEDGEMENTS

Stanley Associates Engineering Ltd. wishes to acknowledge the Alberta Education Steering Committee that consisted of:

Mr. W. Leigh Hill/Mr. Ray LaFleur/Co-Chairmen
Dr. Warren Hathaway
Mr. Dana Sundmark
Mr. Dan Stoker/Alberta Energy and Natural Resources
Mr. Bill Ede

and the Zone Energy Consultants:

Zone 1: Chris Peter
Zone 2: Phil Cox
Zone 3: Joe Santos
Zone 4: Jeff Bannard
Zone 5: Andy Christie

and J.R. Houghton, Coordinator Environmental Education, Alberta Education for his contribution of curriculum background materials.

The Stanley Associates Engineering Ltd. project team was:

David A. Kinnaird, Project Manager
Robert D. Fiedler, Project Planner
Sheila Speers, Research Planner

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EXECUTIVE SUMMARY

BACKGROUND

Stanley Associates Engineering Ltd. was commissioned in February 1982 to undertake a qualitative evaluation of the Phase 2: Energy Conservation Field Projects. This evaluation will provide stimulation and input for the continuation of the administrative and sponsorship programme, possibly extended Province-wide to all schools which express an interest in practicing the principles of energy conservation through technical retrofitting, motivational management, and curriculum support.

Phase 2 had distinct objectives that were:

1. "Test the generalizability of the energy conservation measures outlined in **Guidelines for Conserving Energy in Alberta Schools** and augment these guidelines as required;
2. Develop standards of energy consumption for Alberta schools by school type and size, and on the basis of climate; and
3. Provide lighthouse projects that are readily accessible by personnel from surrounding jurisdictions." (1)

The programme derived for Phase 2, therefore concentrated on a technical component designed to deduce deficiencies in school buildings and to develop corrective measures.

(1) Hathaway, W.E., Designing Energy - Efficient Schools, Council of Educational Facility Planners Conference, Anchorage, Alaska (June 1981), Page 4.

RESEARCH ACTIVITIES

The research activities in this assignment consisted of a literature review that was followed by a series of interviews, a workshop and meetings with the Steering Committee. Interviews took several forms. A detailed survey sheet was constructed to be used in person-to-person interviews with senior administrators, principals and teachers in each zone who were or had been involved with the energy conservation field project. Custodial staff in some cases maintained hours that were not travel conducive, therefore, telephone interviews were conducted. Additional interviews both in person and via telephone were made with individuals who were considered key actors in this assignment, and with individuals who were considered to be the administrative suppliers and designers of the services. Optional components involved interviews with administrators who were involved with energy conservation retrofits of school buildings via acquisition of the Building Quality Restoration Program (BQRP) and separate from the energy conservation field project.

More than 150 individuals were participants in the series of interviews, including school board administrators, principals, teachers and custodians. It is their perceptions, opinions and attitudes that have provided the information required in this qualitative evaluation of the Phase 2: Energy Conservation Field Projects which leads to the conclusions, the origin of the recommendations scribed in this report.

Zone energy consultants' perceptions of the project were probed via a day long workshop. Background to the involvement of Alberta Energy and Natural Resources in the curriculum component, and energy conservation aspects of the **Curriculum Guides** were compiled to form the basis for qualitative analysis of the curriculum component for this component.

SPONSORSHIP

The vast proportion of the project sponsorship was utilized for retrofitting the school buildings in each zone. Monies denoted in this section do not include operating costs,

(eg) administration costs and salaries, nor indirect contributions through the Energy Bus mobile audit service. Total project grants were $547,000.

The BQRP was used to extend the project funds. Its use for school building retrofits varied according to each school jurisdiction and ranged from 34-70 percent of project costs. The average was 51 percent of project costs and the total BQRP expenditure was about $574,000.

A third cost sponsorship of $5800 was contributed from one school board. The grand total of field project expenditures was about $1,126,300.

CONCLUSIONS

In summary, the objectives of Phase 2: Energy Conservation Field Project were realistic, and they were attained. Further success will depend on the nature of promotion and further research. Further reviews of Alberta Education's energy conservation strategy and implementation procedures are warranted. Opportunities exist to improve service delivery, to increase communication between recipients and project personnel, and to increase the effectiveness of the curriculum and motivation components.

Technical Components

Most recipients of the programme, as well as the suppliers of the services leading to technical retrofits, were in agreement that the retrofits were warranted, were necessary to reduce energy consumption and therefore were worthwhile investments.

(i) Technical Service Delivery

Most of the energy consultants rated the technical service delivery of their assignment satisfying due to the degree of perceived success. Recipients of the service believed generally that they had acquired good service from their respective energy consultant. Most custodians and some principals believed that poor communications between the

energy consultant and themselves interfered with a maximum transfer of information and ideas.

(ii) The Energy Steering Committees

The Energy Steering Committees were viewed by a majority of respondents as an important project control and information dissemination mechanism. However, informality in meeting logistics, as well as limited membership in some of the zone Energy Steering Committees, reduced information dissemination from supplier to user of the service delivered. In some instances the committee membership may have isolated itself from some information opportunities (eg) feedback from the bottom up.

(iii) The Energy Consultants

The majority of respondents who voiced an opinion on this subject would like to see the energy consultants remain in the public sector. The existing model was perceived to be a very workable one.

(iv) Motivation Component

The motivation component was perceived to be an area of moderate success and one that required adjustments by both energy consultant and recipients alike. These general problems could be divided into communications, motivation problems created by retrofit deficiencies, and teacher support deficiencies. A major effort in all zones aimed at motivating energy conservation in schools has not been introduced nor maintained.

(v) Curriculum Component

Energy consultants and recipients of the field project alike believed that the curriculum component was only a moderate success in spite of the work by the Energy Conservation Branch of Alberta Energy and Natural Resources.

(vi) The Original Guideline Document

The **Guidelines for Conserving Energy in Alberta Schools** was little used by the energy consultants on the grounds that it was too elementary for their purposes, although they utilized many of the concepts contained therein. The content of the **Guidelines**, however, appears sound based on the responses of knowledgeable individuals who have reviewed them.

(vii) Energy Conservation Standards

There was a full range of response regarding instituting standards and regulations to promote energy conservation in the Province. A number of people supported the concept; however there was considerable concern regarding the ability to have a standard for retrofits given the variety in age of the buildings, construction techniques, heating, ventilating and air conditioning (HVAC) systems, fuels, community use and climate. It was suggested that guidelines be developed rather than standards. However, the use of standards and implementing them through regulations was supported for new construction. Most people felt that Alberta Education should take the lead in this area with regulations, sponsorship and design support.

RECOMMENDATIONS

Generally three elements should be considered:

i) internal organization to coordinate energy conservation in school buildings;
ii) further research; and
iii) implementation procedures following Phase 2.

Internal Organization to Coordinate Energy Conservation in School Buildings

Activities and philosophical orientation towards energy conservation should be coordinated between the Branches in the Department.

Further Research

Additional research should include:

i) Building Quality Restoration Program;
ii) Integration of high technology into schools;
iii) Revitalized information package;
iv) The **Curricula Guides**; and
v) Curriculum support materials.

Implementation Procedures Following Phase 2

Implementation activities should involve considerations of:

i) Scale;
ii) Maximum testing in selected schools; and
iii) Enhanced information, motivation and promotion efforts.

SECTION 1

INTRODUCTION

1.1 BACKGROUND

Stanley Associates Engineering Ltd. was commissioned in February 1982 to undertake a qualitative evaluation of the Phase 2: Energy Conservation Field Projects. This evaluation will provide stimulation and input for the continuation of the administrative and sponsorship programme, possibly extended Province-wide to all schools which express an interest in practicing the principles of energy conservation through technical retrofitting, motivational management, and curriculum support.

Energy conservation endeavours applied to school buildings in Alberta have included:

i) energy conservation consciousness for beneficiaries and motivational programmes for maintenance and custodial staff;
ii) the establishment of energy utilization standards in design guidelines for new school construction as well as school retrofit projects;
iii) grants and technical support for school building retrofit; and,
iv) the encouragement of energy conservation material in school curricula at the elementary school level.

Alberta Education has promoted these elements through a two phase school based energy conservation project. The first phase projects addressed new school design and energy standards at Sweetgrass Elementary School in Edmonton, energy conservation management and motivation in the Grande Prairie School District No. 2357, as well as technical retrofits in Calgary Board of Education schools. These projects have provided background for a "50 school" test programme with which this evaluation deals. A publication geared towards stimulating energy conservation interest and practices was published by Alberta Education and was distributed to all schools in the Province. It was a handbook and was titled **Guidelines for Conserving Energy in**

Alberta Schools. Phase 2 of the programme was developed to rectify skill deficiencies in staff employees of the schools which caused recommendations in the handbook to not be adopted to their full potential. Five energy consultants were retained to oversee the retrofit field projects. Alberta Education allocated $587,500 in grants to the schools for retrofitting purposes and this was exclusive of the operating costs allocated for administration and the energy consultants. The energy consultants were made aware of the cost-sharing potential between school boards and the Province via the Building Quality Restoration Program (BQRP) in order to maximize potential gains in energy conserving features. The retrofit designs were deduced from an analysis of information that was gained via energy audits in the schools in each of the five zones in the Province.

Phase 2 had distinct objectives that were:

1. "Test the generalizability of the energy conservation measures outlined in **Guidelines for Conserving Energy in Alberta Schools** and augment these guidelines as required;
2. Develop standards of energy consumption for Alberta schools by school type and size, and on the basis of climate; and
3. Provide lighthouse projects that are readily accessible by personnel from surrounding jurisdictions." (1)

The programme derived for Phase 2, therefore concentrated on a technical component designed to deduce deficiencies in school buildings and to develop corrective measures. This resulted in "housekeeping" maintenance as well as technical additions to the physical plant. Further, a management component was derived to permit the users of the buildings and recipients of the technical advice to maximize their opportunities of efficient operations. It minimized energy consumption and thus reduced costs. The third component, a student involvement programme was considered to be the vehicle by which energy conservation principles could be provided in the classroom.

(1) Hathaway, W.E., Designing Energy - Efficient Schools, Council of Educational Facility Planners Conference, Anchorage, Alaska (June 1981), Page 4.

1.2 STUDY OBJECTIVES

The objectives that were addressed during this research assignment are the following:

i) To discover whether the objectives of the Phase 2 project were realistic and attainable;

ii) To judge whether the processes chosen for completing the objectives were appropriate;

iii) To decide whether the human and financial resources provided for the project were adequate;

iv) To look at the current status of technical retrofits, motivational and student involvement programmes in each zone to determine if there were weaknesses and areas for improvement; and,

v) To develop conclusions and recommendations that are designed to provide direction for a Province-wide energy conservation programme for schools.

Research regarding "realistic" and "attainable" objectives has entertained the notion of enquiring of both user and sponsor of the energy conservation programme. In both cases enquiries sought user attitudes and perceptions of utility. User volition to implement energy conservation activities was questioned, and was based on two perceptions. The first was the likely recognition that a positive fiscal impact may be attained whereas the second perception was related to what appears to be evolving quickly into a societal more.

In both user and sponsor cases, the priority that an energy conservation programme had in total financial matters was reviewed. Should perceptions of priority be incongruent, then the resulting effect could be reduced. Such a test for the perception of ranking should provide feedback regarding the nature of regional consulting programmes prepared in-house, as well as assisting in assessing the adequacy of processes selected as implementation measures. Resource commitment too was scrutinized to assess adequacy in both utility by programme acceptance and delivery process.

The fourth objective can be differentiated into three categories. Technical retrofit status can be expressed by a classification of activity by school and jurisdiction location, type, timing, construction problems, durability, cost, and commentary, prior to deducing an impact. Motivational enquiries concentrated on impressions judged by school board, administrators, principals and teachers. The success of student involvement programmes was difficult to evaluate in this assignment. It was noted qualitatively in terms of curricula promotion and the programme sponsored by the Energy Conservation Branch, Alberta Energy and Natural Resources.

1.3 RESEARCH DECISION POINTS

Questions that reflect the themes and issues of the investigation were termed research decision points. In summary, they provided general avenues by which the methodology was prepared and the research was conducted. Stated, they are:

a) How do the general programme contents of the publication **Guidelines for Conserving Energy in Alberta Schools** compare to programmes in selected Canadian and Northern U.S. jurisdictions?

b) What components of the programme are utilized in each retrofit school example and what components are ignored?

c) Are the roles of the energy consultants consistent and effective in the five zones?

d) What is the perceived role of the energy consultant by sponsoring agency, recipient school and the energy consultants?

e) What monitoring has been on-going in terms of energy use by each school and are the roles of the energy committees consistent and effective?

f) What costs are incurred for each retrofit including capital and operating costs to supply the service?

g) What is the cost share, and how is this perceived by sponsor and recipient?

h) What application procedures for the Building Quality Restoration Program are perceived to be suitable/unsuitable by the field test schools and the few schools who have independently acquired BQRP sponsorship for energy conservation purposes?

i) Are the arbitrary standards of energy use and payback for retrofit reasonable, currently and over the payback period?

j) At what point should the standards alter and how will this impact upon the schools already retrofitted and the remainder throughout the Province?

k) Will the mode of providing energy consultants be realistic within the realm of the public sector should the field project be extended to all existing schools in Alberta?

l) To what degree could and should an energy conservation programme be included in the School Building Regulations? This research decision point was reconsidered as: Should energy consumption performance standards be part of Provincial Regulations?

m) Are students, teachers and staff reacting in daily circumstances to energy conservation curricula where they are present in the retrofitted field test schools?

n) Has a list of "energy dog" schools been assembled in the jurisdiction involved in the field tests and across the Province for the purpose of noting a potential expansion programme and priority sheet?

o) Through the recipients of the BQRP funds for retrofit, what demonstration mechanisms would be reasonable to encourage an expansion of the retrofit programme?

1.4 RESEARCH ACTIVITIES

The research activities in this assignment consisted of a literature review that was followed by a series of interviews, a workshop and meetings with the Steering Committee. The workshop was a day long session held in Edmonton to examine the perceptions of roles, activities and progress that all zone energy consultants considered to be the extent of their work. The workshop was significant in terms of identifying concerns and perspectives held by the field personnel and their supervisor.

Literature Search

The literature search took several forms. It involved the review of publications that were available via local sources such as Alberta Education, the University of Alberta, the corporate library of Stanley Associates Engineering Ltd., and private collections of some Steering Committee members as well as the study team. Departments of Education and some Crown corporations were contacted in British Columbia, Ontario, Yukon Territory, Northwest Territories, Saskatchewan and New Brunswick in Canada, as well as Washington State and Alaska. The Council of Education Facility Planners

International in Ohio was also contacted for the purpose of expanding the literature search and to produce a bibliography. Finally a computer data base search was conducted using CAN/OLE* (CODOC) and DIALOG (ERIC)**. The last items are included in the bibliography in **Appendix I.**

One of the objectives of the extensive literature search was to locate comparable publications to the **Guidelines for Conserving Energy in Alberta Schools,** by Alberta Education. It was discovered that the British Columbia Ministry of Education has prepared two publications dealing with energy conservation in schools. A comparison of the Alberta and British Columbia guidelines was undertaken.

(i) **Guidelines for Conserving Energy in Alberta Schools.** Alberta Education, 1978.

The publication begins by defining units of measure (kilowatt hours, degree days, etc.), and then provides a background on previous energy conservation studies in Alberta Schools. Guidelines on developing an energy conservation programme are given, including an energy budget, energy audit, and return on investment. Copies were widely distributed by Alberta Education.

Measures that teachers, students, caretakers and maintenance personnel can take are itemized, such as turning off lights in vacant rooms and the cleaning of air filters monthly. Specific steps for heating, ventilating and air conditioning (HVAC), lighting, electrical, structural, and water systems in both retrofitting and new school construction are outlined. Guidelines on evaluating the programme, a list of references, conversion factor tables, sample charts for the energy audit, and recommended lighting levels complete the publication.

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* Canadian On-Line Enquiry (Cooperative Documents Project)
** Educational Resources Information Centre

(ii) **Energy Conservation for Schools.** British Columbia Ministry of Education, Science and Technology, 1979.

British Columbia has developed a similar publication, introducing an energy conservation programme for schools. Copies were mailed out to the Secretary-Treasurer and Superintendent of each School District, with a second mailing to school plant officials one year later. The booklet explains the need for energy conservation, and describes the steps of setting up a conservation program: (i) appoint an energy conservation manager; (ii) keep energy consumption records; (iii) compare consumption figures; (iv) conduct energy surveys to determine ways of saving energy. It recommends that the energy survey examine ventilation systems, night set back of temperature, automatic controls, boiler plants, domestic hot water system, building tightness, electrical power consumption, and potential retrofitting needs. Improvements that schools should consider are suggested, such as installing lower flow rate shower heads or weatherstripping around doors and windows. Teachers are advised to: (i) turn out lights in vacant rooms; (ii) turn off exhaust fans, equipment when not in use; and (iii) try shutting off lights adjacent to windows. Sample energy audit forms are included, and energy consumption targets are given. The publication is not as detailed as the Alberta guidelines, and does not include curriculum suggestions, retrofitting measures, or guidelines for new school design.

(iii) **Energy Conservation for School Facility Construction.** British Columbia Ministry of Education, Department of Facilities Services, November 1980.

This publication, modeled after the National Research Council's **Energy Conservation in New Buildings,** is designed to supplement the **National Building Code of Canada.** It is to be included in the **School Facilities Policy and Procedure Manual,** along with guidelines for consultants undertaking energy conservation retrofit work. The guidelines are to be followed in the construction of all new facilities, additions, and modifications, although they are not yet legislated. Details on insulation, glazing, doors, infiltration, design temperatures, ventilation, temperature control, heating and cooling, pipe and duct insulation, HVAC equipment, heat recovery systems, water heating, electrical services and lighting are included.

Interviews

Interviews took several forms. A detailed survey sheet was constructed to be used in person-to-person interviews with senior administrators, principals and teachers in each zone who were or had been involved with the energy conservation field project. A few trial interviews with custodians were made and it was apparent that a second, shorter and specific-user survey sheet had to be designed. Custodial staff in some cases maintained hours that were not travel conducive, therefore, telephone interviews were conducted. Additional interviews both in person and via telephone were made with individuals who were considered key actors in this assignment, and individuals who were considered to be the administrative suppliers and designers of the services. Optional components involved interviews with administrators who were involved with energy conservation retrofits of school buildings via acquisition of the BQRP and separate from the energy conservation field project.

More than 150 individuals were participants in the series of interviews. It is their perceptions, opinions and attitudes that have provided the information required in this qualitative evaluation of the Phase 2: Energy Conservation Field Projects which leads to the conclusions, the origin of the recommendations scribed in this report.

SECTION 2

THE TECHNICAL RETROFITTING COMPONENT

Clusters of nine, ten and eleven schools in the five zones across the Province were involved in the energy conservation field projects. Eight school jurisdictions participated in the project and the original schools are named in Table 2.1. One school in the Fairview School Division, No. 50 did not participate due to its fire destruction on 7 December 1980, MacAuley School is part of E.E Oliver Elementary School and St. Agnes Elementary School in Zone 3 was withdrawn from use. This reduced the participating schools to 51 in number, although the name, "the 50-school project" was used. It appears that 52 schools received project funds.

The most frequent retrofits consisted of night setback thermostats (13%), parking plug cycling (8%), low leakage dampers (7%), urinal flush controls (7%) and infrared scans and boiler tune-ups (7%). A complete listing of retrofit by type is provided in **Appendix A.**

2.1 ZONE 1 REVIEW

Zone 1 contains: 5 schools in the Fairview School Division, No. 50; 4 schools in the Peace River School Division, No. 10; and the one school in the St. Thomas More RCSSD, No. 35. The total expenditure for the field project was about $274,500, of which about $99,300 (36%) were provided by the project grant. The distribution of cost sponsorship is listed in Table 2.2 and the percentage distribution is noted in Table 2.3.

TABLE 2.1
PARTICIPATING SCHOOL JURISDICTIONS AND SCHOOLS

ZONE 1

Fairview School Division No. 50
Grace Shepherd Elementary School
Hines Creek Jr./Sr. High School
Fairview High School
McAuley School*
E.E. Oliver Elementary School*
Whitelaw Elementary School
Fairview Junior High School**

Peace River School Division No. 10
Brownvale Elementary/Junior High School
Lloyd Garrison Jr./Sr. High School
Grimshaw Jr./Sr. High School
Kennedy Elementary School

St. Thomas More R.C.S.S.D. No. 35
St. Thomas More School

TOTAL: 10 Schools

ZONE 2

Lakeland R.C.S.S.D. No. 150
Notre Dame Elementary School
Ecole Notre Dame Junior High

Lakeland Public School District No. 5460
Ardmore School
Cold Lake Public School
Iron River School
Duclos School
Fort Kent School
Glendon School
Grand Centre Elementary/Junior High School
Grand Centre Senior High School

TOTAL: 11 Schools

ZONE 3

Edmonton R.C.S.S.D. No.7
Austin O'Brien High School
Father Lacombe School
St. Agnes Elementary School***
St. Alphonsus School
St. Andrew School
St. Augustine School
St. Basil School
St. Boniface School
St. Clare School
St. Dominic School

TOTAL: 9 Schools

ZONE 4

Rocky View School Division No. 41
George McDougall High School
Beiseker School
Chestermere Jr./Sr. High School
Cochrane High School
Andrew Sibbald Elementary School
Springbank Community High School
Elizabeth Barrett Elementary School
Conrich School
Springbank Junior High School
Elbow Valley Elementary School
Edwards Elementary School

TOTAL: 11 Schools

ZONE 5

Medicine Hat School District No. 76
Alexandra Junior High School
Connaught Elementary School
Crescent Heights Jr./Sr. High School
Crestwood Elementary School
Elm Street Elementary School
Herald Elementary School
Montreal Street Elementary School
River Heights Elementary School
Vincent Massey Elementary School
Webster Niblock Elementary School

TOTAL: 10 Schools

* McAuley and E.E. Oliver are one school site, formerly called Fairview Elementary

** Burned down December 7, 1980

*** Ceased functioning as a school building

Source: Alberta Education

TABLE 2.2

FIELD PROJECT SPONSORSHIP COST SHARE

Zone Number	School Jurisdiction	Total Project Expenditure ($)	Cost Share			No. of Participating Schools
			Project($)	BORP($)	Board($)	
1	Fairview School Division, No. 50	177,890	54,242	123,648	0	6
	Peace River School Division, No. 10	65,706	25,492	40,214	0	4
	St. Thomas More, RCSSD. No. 35	30,900	19,600	11,300	0	1
	ZONE TOTAL	274,496	99,334	175,162	0	11
2	Lakeland, RCSSD. No. 150	45,545	19,517	26,028	0	2
	Lakeland Public School District, No. 5460	211,841	93,200	118,641	0	8
	ZONE TOTAL	257,386	112,717	144,669	0	10
3	Edmonton RCSSD. No. 7	162,830	107,298	55,532	0	10
4	Rocky View School Division,	223,592	112,290	105,502	5,800	11
5	Medicine Hat School District, No. 76	208,045	115,000	93,045	0	10
	TOTALS	1,126,349	546,639	573,910	5,800	52

Source: Alberta Education

TABLE 2.3
PERCENTAGE DISTRIBUTION OF SPONSORSHIP
TOTAL FIELD PROJECT

Zone Number	School Jurisdiction	% Distribution of Sponsorship		
		Project	BQRP	Board
1	Fairview School Division, No. 50	30.5	69.5	0.0
	Peace River School Division, No. 10	38.8	61.2	0.0
	St. Thomas More RCSSD, No. 35	63.4	36.6	0.0
	ZONE AVERAGE	36.2	63.8	0.0
2	Lakeland, RCSSD. No. 150	42.8	57.2	0.0
	Lakeland Public School District No. 5460	44.0	56.0	0.0
	ZONE AVERAGE	43.8	56.2	0.0
3	Edmonton RCSSD. No. 7	65.9	34.1	0.0
4	Rocky View School Division, No. 41	50.2	47.2	2.6
5	Medicine Hat School District No. 76	55.3	44.7	0.0
	TOTAL	48.5	51.0	0.5

Source: Alberta Education

2.2 ZONE 2 REVIEW

Zone 2 contains 2 schools in the Lakeland Roman Catholic Separate School District, No. 150 and 9 schools in the Lakeland Public School District, No. 5460. Total project expenditures in this Zone were about $257,400 of which about $112,700 (44%) were provided by the project grants.

2.3 ZONE 3 REVIEW

The Edmonton Roman Catholic Separate School Division, No. 7 project expenditure was about $162,800 of which $107,300 (66%) were obtained from direct field project grants. This division contained 10 project schools, one of which was withdrawn from the project at an early stage. Both project and BQRP funds were expended on St. Agnes Elementary prior to its withdrawal.

2.4 ZONE 4 REVIEW

Eleven schools in the Rocky View School Division, No. 41 generated $223,600 in retrofit expenditures. More than $112,300 (50%) were obtained from the field project grant, nearly $105,500 (47%) were BQRP sponsored and $5,800 (3%) were provided by the Division.

2.5 ZONE 5 REVIEW

Zone 5 contains 10 schools in the Medicine Hat School District, No. 76 and project expenditures were $208,000 of which $115,000 (55%) were field project grants.

Generally the prudent use of auxiliary funds via BQRP increased direct project contributions by approximately 105% throughout the study zones. Approximately 15,750 students of the 1981-82 school year have benefitted from the energy conservation field project as shown in Table 2.4. Another way to note this would be that on the average $71/student were spent via direct project grant and BQRP monies from Alberta Education.

TABLE 2.4

ENROLLMENT IN PROJECT SCHOOLS

ZONE 1	ENROLLMENT
Fairview School Division No. 50	
Grace Shepherd Elementary School	216
Hines Creek Jr./Sr. High School	170
Fairview High School	257
McAuley School*	-
E.E. Oliver Elementary School*	425
Whitelaw Elementary School	41
Fairview Junior High School**	-
Peace River School Division No. 10	
Brownvale Elementary/Junior High School	48
Lloyd Garrison Jr./Sr. High School	228
Grimshaw Jr./Sr. High School	249
Kennedy Elementary School	257
St. Thomas More R.C.S.S.D. No. 35	
St. Thomas More School	365
TOTAL:	2,256

ZONE 2	ENROLLMENT
Lakeland R.C.S.S.D. No. 150	
Notre Dame Elementary School	488
Ecole Notre Dame Junior High	275
Lakeland Public School District No. 5460	
Ardmore School	184
Cold Lake Public School	258
Iron River School	157
Duclos School	161
Fort Kent School	98
Glendon School	388
Grand Centre Elementary/Junior High School	484
Grand Centre Senior High School	510
TOTAL:	2,999

ZONE 3	ENROLL
Edmonton R.C.S.S.D No.7	
Austin O'Brien High School	75
Father Lacombe School	10
St. Agnes Elementary School***	
St. Alphonsus School	3
St. Andrew School	1
St. Augustine School	1
St. Basil School	4
St. Boniface School	2
St. Clare School	2
St. Dominic School	3
TOTAL:	2,

ZONE 4	ENROLLMENT
Rocky View School Division No. 41	
George McDougall High School	425
Beiseker School	286
Chestermere Jr./Sr. High School	461
Cochrane High School	381
Andrew Sibbald Elementary School	423
Springbank Community High School	307
Elizabeth Barrett Elementary School	414
Conrich School	304
Springbank Junior High School	431
Elbow Valley Elementary School	432
Edwards Elementary School	447
TOTAL:	4,311

ZONE 5	ENROLLMENT
Medicine Hat School District No. 76	
Alexandra Junior High School	448
Connaught Elementary School	220
Crescent Heights Jr./Sr. High School	921
Crestwood Elementary School	395
Elm Street Elementary School	112
Herald Elementary School	233
Montreal Street Elementary School	151
River Heights Elementary School	219
Vincent Massey Elementary School	389
Webster Niblock Elementary School	271
TOTAL:	3,359

* McAuley and E.E. Oliver are one school site, formerly called Fairview Elementary

** Burned down December 7, 1980

*** Ceased functioning as a school building

Enrollment excludes ECS figures

Source: Alberta Education

2.6 THE ENERGY AUDIT PROGRAMME

A separate service to that provided by the zone energy consultant was made available to some of the 50 schools of the field project. Generally used in public and commercial building applications, an energy audit programme was provided via the "Energy Bus". Public applications have included some recreation facilities and some school buildings. The twelve Energy Conservation Field Project schools that were recipients of the Energy Bus mobile audit are listed in Table 2.5. Presentations of findings of each "maxi-energy audit" were conducted at each of the twelve schools and they generally involved a school board official, the principal and custodial/maintenance staff. The use of comprehensive technical energy audit service during the school building retrofitting is mentioned only for information purposes in this report.

2.7 DERIVATIVES

The vast proportion of the project sponsorship was utilized for retrofitting the school buildings in each zone. Monies denoted in this section do not include operating costs, (eg) administration costs and salaries, nor indirect contributions through the Energy Bus mobile audit service. Total project grants were about $547,000.

The utility of the mobile energy audit service via the Energy Bus and its impact on the retrofitting procedure was not evaluated during this analysis.

The BQRP was used to extend the project funds. Its use for school building retrofits varied according to each school jurisdiction and ranged from 34-70 percent of project costs. The average was 51 percent of project costs and the total BQRP expenditure was about $574,000.

A third cost sponsorship of $5800 was contributed from one school board. The grand total of field project expenditures was about $1,126,300.

TABLE 2.5

ENERGY BUS PROGRAMME RECIPIENTS

ZONE	SCHOOL JURISDICTION	SCHOOL NAME	DATE OF PRESENTATION
1	Fairview School Division No. 50	Fairview High	10 June 1981
		Kennedy Elementary	8 June 1981
	St. Thomas More, RCSSD, No. 35	St. Thomas More	3 Nov 1981
2	Lakeland Public School District No. 5460	Grand Centre High	15 June 1981
	Lakeland RCSSD No. 150	Ecole Notre Dame Junior High	17 June 1981
3	Edmonton RCSSD No. 7	Austin O'Brien High	22 Sept 1981
		St. Basil High	31 March 1981
		St. Augustine Junior High	14 Sept 1981
4	Rocky View School Division No. 41	Elbow Valley Elementary	14 April 1981
		George McDougall High	15 Feb 1982
5	Medicine Hat School District No. 76	Connaught Elementary	1 Dec 1981
		Crescent Heights Jr./Sr. High	2 Dec 1981

Source: Alberta Energy and Natural Resources

SECTION 3

THE MOTIVATION COMPONENT

3.1 SPONSORSHIP LEVEL

Motivational activities are not as capital intensive as technical retrofits, so order of magnitude comparisons are not valid as a measure of effort. Direct field project capital expenditures for the motivation component totalled $5,480. Also there were contributions to this component which are not represented by project funding. These contributions include time allocations by field representatives, the School Board level Energy Conservation Committees as well as publication of the **Energy Conservation Quarterly.** These contributions have not been quantified to establish another parameter by which to judge the extent of such an endeavor.

3.2 MOTIVATIONAL ACTIVITIES SUMMARY

During the course of the two year project, several methods were tried for the purpose of motivating, or more directly stated, to introduce energy conservation information to participants to engender the 'wise use of energy'. These measures can be classified into three categories: indirect or spin-off measures; direct measures; and, school board initiated measures.

Indirect measures include the informal liaison between the energy consultants and the staff and students that resulted from the presence of the consultants in the school and the fact that work was being done. Another indirect motivational effort resulted from some of the curriculum support material utilized in the project. The differentiation between motivation and curriculum as distinct measurable components is not very clear in many instances.

Direct motivational measures related to field project activities are the following:

i) The energy consultants held meetings sporadically with their Energy Steering Committees and met with some representatives of the curriculum sub-committees.

ii) The **Energy Conservation Quarterly** was published by Alberta Education, starting in December 1980;

iii) Lighthouse or demonstration days for public consumption have been held in one school in each zone in the Spring of 1982;

iv) The installation measures to increase the quality of the teachers' working environment, (eg) the full spectrum lighting and negative ion generators that were installed in staff rooms of field project schools in Zone 3.

v) the energy consultants were used as resource persons by some teachers; and,

vi) production of slide/tape shows regarding the field project and energy conservation.

Major motivation management activities initiated primarily at the local level were found in the Medicine Hat and Peace River School Districts. Other activities occured in every District but did not represent a district wide effort.

An example of school board initiated measures involved the Medicine Hat School District which was interested in energy conservation prior to the field project. The District had formed an Energy Steering Committee under its own volition. The field project acted as a catalyst for the District to move further in energy conservation. One outcome of this emphasis was that the Board adopted an Energy Conservation Policy in September 1981, and an Energy Savings Plan in October 1981. Both are noted in **Appendix B.**

The Energy Conservation Policy implemented an energy management program that "encourages staff and students to develop habits of an energy conserving nature in their general life style". The Energy Conservation Policy identifies energy management measures that are the responsibility of the following groups within the District:

i) School Board
ii) Energy Conservation Committee
iii) Administrators
iv) Teachers
v) Students
vi) Clerical Staff
vii) Custodial Staff

This Policy also identified maintenance and general operating energy conservation measures for the school. The Energy Savings Plan addresses more directly the motivation aspects of energy saving. This Plan was a rebate system to reimburse individual schools a major percentage of savings resulting from their energy conservation efforts, as compared to energy consumption in a base period of the preceding thirty-six months. The rebate could be used for whatever purposes school personnel believed were most beneficial.

The Peace River School Division has also adopted an Energy Conservation Policy, similar in intent to the one adopted by the Medicine Hat School Division but less extensive in scope. Its supporting plans and procedures yet have to be established for the energy management program.

3.3 DERIVATIVES

The extent of monetary contributions to this component is difficult to assess due to the unknown expenditures in operating costs.

Time commitments to this component by the zone energy consultants, in essence a reflection of the operating costs related to the project have not been evaluated in this analysis. Additional costs that must be considered as part of the motivation component are those which are related to the publication, the **Energy Conservation Quarterly**, by Alberta Education.

SECTION 4

THE CURRICULUM COMPONENT

4.1 SPONSORSHIP LEVEL

The curriculum component is not as capital intensive as the technical component and a direct order of magnitude comparison is not valid as a measure of effort. Money expended directly via the project grant by Alberta Education for curriculum materials was about $10,400. In all cases, the project values do not include operating expenses such as salaries and travel disbursements. This value excludes the value added through the work of Alberta Energy and Natural Resources, Zone Energy Conservation Curriculum Sub-Committees as well as the efforts of individual teachers and energy consultants. The lead for developing curriculum support materials and student involvement in the project was taken by the Energy Conservation Branch of the Department of Energy and Natural Resources.

4.2 BACKGROUND TO THE CURRICULA GUIDES

The Curriculum Branch of Alberta Education was not directly involved in the Energy Conservation Field Project although the main impetus for the project within Alberta Education came from the School Buildings Branch. This lack of involvement may be due in part to the perception that advocating one component of the curricula over another is not the mandate(1) of members of the Curriculum Branch, but rather it is to develop curriculum guidelines. This generally has been suggested to be a process of greater duration than the two year period of this project. Significant change to the curriculum guidelines can take upwards to ten years, although this period may be proportional to rapid changes in society.

(1) Gary Popowich, Alberta Education

The Curriculum Branch contributed indirectly to the project through the inclusion of the subject area of energy conservation within existing **Curricula Guides.** Opportunities to instruct aspects of energy conservation exist in all grades either directly or indirectly. A direct opportunity is defined as that which relates to energy conservation in the classroom and school, and an indirect opportunity is defined as that which focuses on energy conservation in society as a whole.

Indirect opportunities exist in all grades within the framework of environmental education. Energy conservation is linked to a number of related issues in the **Curricula Guides.** The broadest of these issues includes environmental awareness and respect focusing on the wise use of energy as it relates to resource utilization and industrial development. In addition to the direct and indirect opportunities that exist within environmental education, energy conservation can be taught as an incidental aspect of an unrelated subject area, (eg) energy conservation reading materials in language arts and energy use related problems in mathematics. This type of indirect opportunity was utilized in the field project by having students read meters in the schools to determine energy use, analyze the data to determine trends in energy use, and display the derived information.

Curricula Guides Energy Conservation Content

The scope and depth of opportunities for teaching energy conservation within a school building retrofit project would depend on the nature of desired emphasis on energy conservation subject matter. The emphasis of the curriculum component of the energy conservation field project was to focus on promoting energy conservation in the classroom and school. However, the opportunities for instruction in this subject area within the existing **Curricula Guides** are more extensive and could be classified according to the following criteria:

i) direct emphasis on energy conservation in the classroom and school;
ii) primary focus on energy conservation in total;
iii) energy conservation utilized as an example of a larger environmental concept; and,
iv) environmental issues related to energy utilization and conservation.

Opportunities to include instruction in energy conservation which can be classified by criteria iii) and iv) exist in all grades under current **Curricula Guides,** with particular emphasis on grades 9-12. The more direct emphasis on energy conservation noted in criteria i) and ii) can be found in grades 4 through 8, and 10 through 12 with a particular emphasis in grades 4 and especially 6. Grade 6 may present the most direct opportunity for involvement of students in the conservation of energy in the classroom and school.

The opportunities for teaching energy conservation through grades 1-12 through the broader base of environmental education are noted in Figures 1 to 3. These opportunities are ranked according to the above noted four criteria and are divided into the following curriculum components for each grade:

i) Themes
ii) Objectives
   - o Knowledge and Understanding
   - o Values and Attitudes

iii) Subject Strands

4.3 ALBERTA ENERGY AND NATURAL RESOURCES CURRICULUM CONTRIBUTION

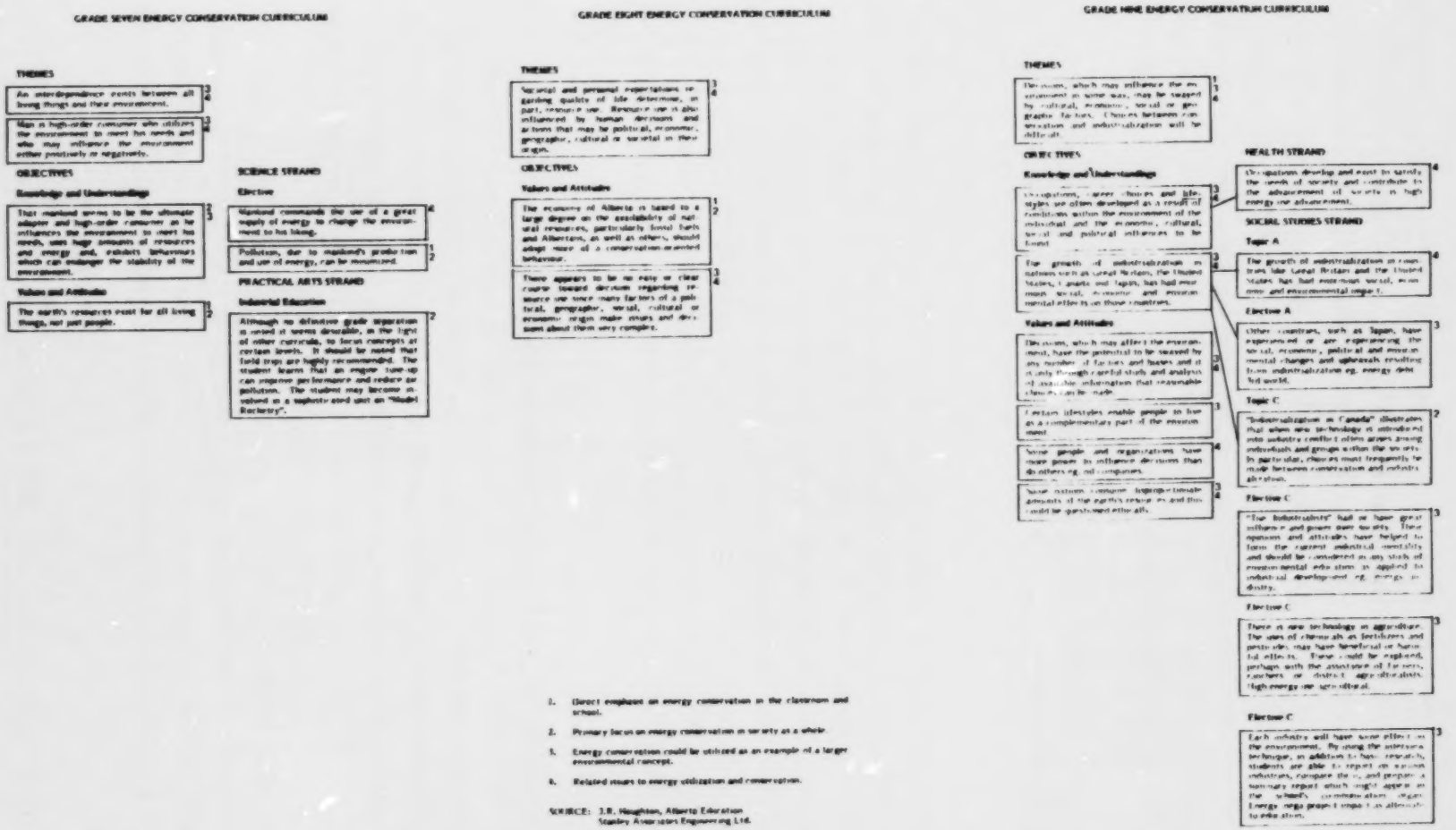
The relevant mandate of the Energy Conservation Branch of Alberta Energy and Natural Resources (ENR) is to provide a programme for the development and the dissemination of curriculum support materials in schools and the facilitation of student recognition of principles of conservation. One focus of this program was the Alberta Education Energy Conservation Field Project.

A summary of energy conservation field project related activities that were conducted by ENR personnel is noted below. These activities are outlined in **Appendix C.** This outline is based on documentation provided by Dan Stoker, Manager, School Programs, Energy Conservation Branch, Alberta Energy and Natural Resources.

FIGURE I
ELEMENTARY ENERGY CONSERVATION CURRICULUM

GRADE ONE ENERGY CONSERVATION CURRICULUM
THEMES
All living things are a part of the environment and must develop a sensitivity to their environment.
OBJECTIVES
Knowledge and Understandings
That the environment can provide the basic necessities of life such as air, soil, water and energy from the sun.
Values and Attitudes
By becoming aware of the environment, individuals can begin to learn about some of the beneficial and harmful things within it.
Individuals can make choices and decisions which affect them and their environment.
SCIENCE STRAND
People need energy to work and play. Plants and animals need energy to live. The sun is the source of all energy.
GRADE TWO ENERGY CONSERVATION CURRICULUM
THEMES
Many forms of energy exist and are used within the environment.
OBJECTIVES
Knowledge and Understandings
That there are many types and sources of energy which are found within the environment.
SCIENCE STRAND
Some energy resources include wood, water and wood. In some ways these are renewable resources.
GRADE THREE ENERGY CONSERVATION CURRICULUM
THEMES
All parts of the environment are related and interact with each other in some way.
OBJECTIVES
Knowledge and Understandings
That within the human community, the advances of technology have led to a growing need for large amounts of resources and raw materials.
That modern technology consumes large amounts of energy and that energy has many forms such as heat, light, sound and electrical.
Values and Attitudes
Humans can exhibit behaviours which can conserve energy and other resources and if human beings preserve the earth and the environment it will be able to continue to support a great diversity of living things.
SCIENCE STRAND
Humans can exhibit behaviours that conserve energy in their environment.
GRADE FOUR ENERGY CONSERVATION CURRICULUM
THEMES
Human impact upon the environment may be either or both beneficial and harmful. Advances in technology have had positive and negative effects.
Energy and other resources within the environment are in limited supply.
OBJECTIVES
Knowledge and Understandings
That the heavy use of raw materials and energy resources has resulted in a search for new or alternate sources.
That MANY technological advances have had a noticeable impact upon the environment and that, in some cases, resource extraction and industrial development has resulted in severe damage to the land, air and water components of the environment.
Values and Attitudes
Humans can be "stewards" of the earth, rather than careless explorers of it.
Humans must develop both a way of thinking and feeling about the earth if we are to be able to live harmoniously with each other and our environment.
SCIENCE STRAND
Energy exists in many forms such as light, heat, chemical and nuclear. Energy may change from one form to another. The notion of energy transfer and energy chains may be studied. There are limits to currently available sources of energy.
SOCIAL STUDIES STRAND
Elective A
Through a study of the "Athabasca Tar Sands" questions as to environmental impact, new technology and economic trade-off can be explored.
GRADE FIVE ENERGY CONSERVATION CURRICULUM
THEMES
With the recognition that the resources of the environment are in limited supply must come an understanding that it is necessary to reserve, preserve and conserve resources wherever and whenever possible.
OBJECTIVES
Knowledge and Understandings
That no individual living thing exists in isolation but rather as a part of a complex set of interrelationships and interdependencies.
Values and Attitudes
Human beings must develop an ecologically sound way of thinking, feeling and acting toward the earth in order to live harmoniously with each other and the environment.
SCIENCE STRAND
Each individual of a species occupies a NICHE. A collection of species is a POPULATION. Different populations within the same habitat form a COMMUNITY. Interacting communities of living and non-living things form an ECOSYSTEM.
1. Direct emphasis on energy conservation in the classroom and school.
2. Primary focus on energy conservation in society as a whole.
3. Energy conservation could be utilized as an example of a larger environmental concept.
4. Related issues to energy utilization and conservation.
SOURCE: J.R. Houghton, Alberta Education
Stanley Associates Engineering Ltd.
GRADE SIX ENERGY CONSERVATION CURRICULUM
THEMES
Man's constantly changing and growing needs for resources and energy have resulted in:
a) competition for scarce resources;
b) the search for resources in unexplored areas;
c) the search for energy source alternatives; and,
d) a system of "trade-offs" being developed.
OBJECTIVES
Knowledge and Understandings
That fossil fuels, such as are found in Alberta, are a primary source of energy but, since these are an limited supply, energy alternatives, some of which may be dangerous to man and the environment, are being sought.
That increasing populations with their demands and needs lead to a scarcity of resources which may result in a system of "trade-offs" and competition for the things that sustain life.
That human needs may be met through mutual cooperation and support.
Values and Attitudes
In Canada, we have become a "throw away" society and greater efforts should be made to reduce, reuse and recycle.
SCIENCE STRAND
Fossil fuels such as those found in Alberta (coal, oil, natural gas) constitute a major source of energy. Alternative sources (solar, wind, biomass, thermal, nuclear) do exist but there are advantages, disadvantages, problems, costs and risks associated with all energy resources.
Society must examine the "trade-offs" that are a part of our energy consuming lifestyle since the future is, in large part, determined by actions in the present.
SOCIAL STUDIES
Elective C
Through a study of "trade-offs" there is an opportunity to focus on the resolution of problems involving scarcity, protection, private rights, government control, negotiation, etc.
HEALTH STRAND
People must develop an understanding of interdependence and a type of social conscience which includes personal and group acceptance of responsibility for such things as public health, the environment and the rights of others.

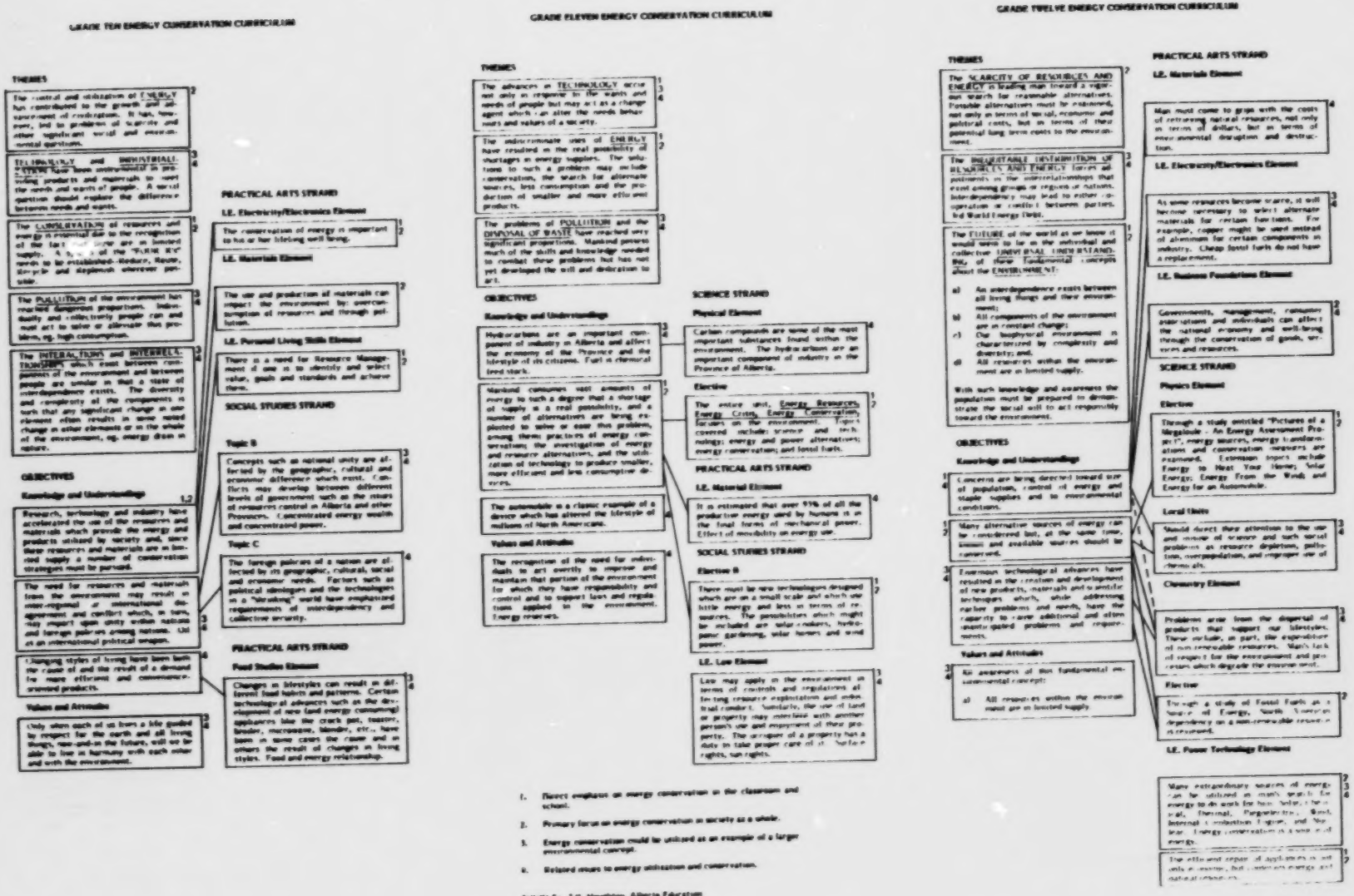
FIGURE 2
JUNIOR HIGH ENERGY CONSERVATION CURRICULUM


GRADE SEVEN ENERGY CONSERVATION CURRICULUM
THEMES
An interdependence exists between all living things and their environment.
Man is high-order consumer who utilizes the environment to meet his needs and who may influence the environment either positively or negatively.
OBJECTIVES
Knowledge and Understandings
That mankind seems to be the ultimate adaptor and high-order consumer as he influences the environment to meet his needs, uses huge amounts of resources and energy and, exhibits behaviours which can endanger the stability of the environment.
Values and Attitudes
The earth's resources exist for all living things, not just people.
SCIENCE STRAND
Elective
Mankind commands the use of a great supply of energy to change the environment to his liking.
Pollution, due to mankind's production and use of energy, can be minimized.
PRACTICAL ARTS STRAND
Industrial Education
Although no definitive grade separation is noted it seems desirable, in the light of other curricula, to focus concepts at certain levels. It should be noted that field trips are highly recommended. The student learns that an engine tune-up can improve performance and reduce air pollution. The student may become involved in a laboratory unit on "Model Factory".
GRADE EIGHT ENERGY CONSERVATION CURRICULUM
THEMES
Societal and personal expectations regarding quality of life determine, in part, resource use. Resource use is also influenced by human decisions and actions that may be political, economic, geographic, cultural or societal in their origin.
OBJECTIVES
Values and Attitudes
The economy of Alberta is based to a large degree on the availability of natural resources, particularly fossil fuels and Albertans, as well as others, should adopt more of a conservation-oriented behaviour.
There appears to be no easy or clear course toward decision regarding resource use since many factors of a political, geographic, social, cultural or economic origin make steps and decisions about them very complex.
GRADE NINE ENERGY CONSERVATION CURRICULUM
THEMES
Decisions, which may influence the environment in some way, may be swayed by cultural, economic, social or geographic factors. Choices between conservation and industrialization will be difficult.
OBJECTIVES
Knowledge and Understandings
Occupations, career choices and lifestyles are often developed as a result of conditions within the environment of the individual and the economic, cultural, social and political influences to be found.
The growth of industrialization in nations such as Great Britain, the United States, France and Japan, has had enormous social, economic and environmental effects on those countries.
Values and Attitudes
Decisions, which may affect the environment, have the potential to be swayed by any number of factors and issues and it is only through careful study and analysis of available information that reasonable choices can be made.
Certain lifestyles enable people to live as a complementary part of the environment.
Some people and organizations have more power to influence decisions than do others eg. oil companies.
Some nations consume larger proportionate amounts of the earth's energy resources and this could be questioned ethically.
HEALTH STRAND
Occupations develop and exist to satisfy the needs of society and contribute to the advancement of society in high energy use advancement.
SOCIAL STUDIES STRAND
Topic A
The growth of industrialization in countries like Great Britain and the United States has had enormous social, economic and environmental impact.
Elective A
Other countries, such as Japan, have experienced or are experiencing the social, economic, political and environmental changes and upheavals resulting from industrialization eg. energy debt 3rd world.
Topic C
"Industrialization in Canada" illustrates that when new technology is introduced into industry conflict often arises among individuals and groups within the society. In particular, choices must frequently be made between conservation and industrialization.
Elective C
"The Industrialists" had or have great influence and power over society. Their opinions and attitudes have helped to form the current industrial mentality and should be considered in any study of environmental education as applied to industrial development eg. energy industry.
Elective C
There is new technology in agriculture. The uses of chemicals as fertilizers and pesticides may have beneficial or harmful effects. These could be explored, perhaps with the assistance of farmers, ranchers or district agriculturists. High energy use agriculture.
Elective C
Each industry will have some effect on the environment. By using the internet technique, in addition to basic research, students are able to report on various industries, compare them, and prepare a summary report which might appear in the school's communication organ. Energy conservation project could be an alternative to education.

1. Direct emphasis on energy conservation in the classroom and school.
2. Primary focus on energy conservation in society as a whole.
3. Energy conservation could be utilized as an example of a larger environmental concept.
4. Related issues to energy utilization and conservation.

SOURCE: J.B. Houghton, Alberta Education
Stanley Associates Engineering Ltd.

FIGURE 3
SENIOR HIGH ENERGY CONSERVATION CURRICULUM



1. Fewest emphasis on energy conservation in the classroom and school.
2. Primary focus on energy conservation in society as a whole.
3. Energy conservation could be utilized as an example of a larger environmental concept.
4. Related issues to energy utilization and conservation.

SOURCE: J.R. Houghton, Alberta Education
Stanley Associates Engineering Ltd.

The approach taken by the Energy Conservation Branch of ENR with respect to the curriculum component of the field project varied greatly from the first year of the project to the second year. It emphasized the promotion of energy conservation through contact with teachers and students in project schools during the first year. The approach focussed more on curriculum support material development, leaving the responsibility to the Alberta Education zone energy consultants to initiate interest, meetings, workshops and to promote the curriculum component in the second year.

The following evaluation of the curriculum component is based partially on documentation provided by Dan Stoker, Manager, School Programs, Energy Conservation Branch, ENR.

The activities during the first year 1980-81 primarily consisted of meetings between ENR personnel and school energy liaison teachers, and the distribution of available curriculum support materials. One deletion from the original activity programme proposed by ENR personnel was a pre- and post-project evaluation of student attitudes regarding energy conservation. This evaluation was prepared by ENR but permission to use it in the field project was not granted by R. Huber, who was at that point the Project Director for the energy conservation field project. The survey instrument designed for pre- and post-project evaluation of student attitudes was not considered adequate.

The activities of ENR personnel during the second year 1981-82 provided support to the Alberta Education energy consultants in the curriculum and motivation components while the concentration of efforts focused on curriculum development. One significant outcome of this effort was **Energy Sleuths**, a grade 6 activity kit designed to complement the field project technical component which had students model the energy audit, and analysis aspects.

One important aspect of the approach that ENR personnel took in the energy conservation field project is that they believed that the curriculum and motivational components should be integrated and should be approached as one. This perspective essentially viewed the field project as having two categories: people and technical.

4.4 THE RURAL SCHOOL VISITATION PROGRAMME

The "RSVP" or "Van Programme" was utilized by ENR to promote energy conservation information to youngsters mainly in grades 1-6 using puppets, and energy Glut Kit. One hundred and eighty-seven schools received the energy van programme throughout the 1981/82 fiscal year and included 25 of the energy conservation field project schools. Dates of visitation are denoted in Table 4.1.

4.5 SIGNIFICANT LOCAL ACTIVITIES

Local activities related to the curriculum and motivation components occurred with the support of the energy consultants and ENR personnel in all districts. These activities included energy conservation days, sweater days, classroom projects, and production of displays for open house schools. Two activities were district wide efforts and they were:

i) The Rocky View School Division Energy Conservation Week
ii) The Medicine Hat School District Energy Conservation Curriculum Committee

Rocky View Energy Conservation Week

The Rocky View Energy Conservation Week held during the week starting April 13, 1981, incorporated a variety of activities for grades one through six. Display materials, speakers, films, energy van and Energy Conservation Achievement Awards, were used with the intent of involving 100 percent of the staff and student population. Student involvement included preparation of an energy conservation display for parents, monitoring and surveying school energy use, model building and discussions prepared by students on the topic of energy conservation. A detailed list of activities and appraisal of the success of the project are noted in **Appendix D.**

The energy conservation week also provided an opportunity for intensive involvement of ENR staff. Their involvement over four days totalled 24 presentations involving 21 hours of instruction reaching 1380 students.

Medicine Hat Energy Conservation Curriculum Sub-Committee

The Medicine Hat School District Energy Conservation Curriculum Committee was initiated in the first year of the project and continues work to date. The committee spent the first year in a developmental mode and the second year in an implementation one.

The committee has produced compilations of energy conservation activity orientated curriculum suggestions for grades 4, 5 and 6. The committee intends to produce an energy conservation handbook on conservation concepts.

4.6 DERIVATIVES

The curriculum component of the energy conservation field project received significant impetus from the involvement of personnel from the Energy Conservation Branch, Alberta Energy and Natural Resources. The contribution of ENR personnel to the field project constituted the most direct involvement in the curriculum component at the Provincial level. However, this contribution appears to have been diminished through the lack of a planning and development phase prior to implementation in the field during the first year of the field project. The fact that the pre- and post-project evaluation of student attitudes towards energy use did not occur made evaluation of the effectiveness of this component difficult to measure.

The curriculum component was supported directly by Alberta Education through funding allocations, and participation of the energy consultants. Further energy conservation is supported indirectly in the **Curricula Guides.** Support for energy conservation at the school board level was best represented by the Rocky View Energy Conservation Week and the Medicine Hat Energy Curriculum Energy Sub-Committee.

TABLE 4.1
ECFP SCHOOLS-RECIPIENTS OF THE RSV PROGRAMME

ZONE	SCHOOL JURISDICTION	SCHOOL NAME	DATE	GRADES VISITED	NO. OF STUDENTS
1	Fairview School Div. No. 50	Lloyd Garrison Jr./Sr. High	15 May 1981	4-5	25
	Peace River School Div. No. 10	Kennedy Elementary	12 May 1981	4-6	103
	St. Thomas More RCSSD No. 35	-	-	-	-
2	Lakeland RCSSD No. 150	Ecole Notre Dame Jr. High	6 April 1981	7-9	270
		Notre Dame Elementary	7 April 1981	4-6	308
	Lakeland Public School District, No. 5460	Cold Lake Elementary	8 April 1981	4-7	101
		Duclos	9 April 1981	4-6	105
		Glendon	10 April 1981	4,5,6,10	120
3	Edmonton RCSSD No. 7	St. Boniface	18 March 1981	4-6	212
		St. Dominic	20 March 1981	3-5	308
		St. Basil	27 May 1981	6	48
4	Rocky View School Division, No. 41	Edwards Elementary	13 April 1981	4-5	202
		Conrich	14 April 1981	4-6	152
		Beiseker	14 April 1981	4-6	77
		Andrew Sibbald Elementary	15 April 1981	2-3	153
		Elbow Valley Elementary	15 April 1981	4-6	160
		Elizabeth Barrett Elementary	16 April 1981	4-6	103
		Andrew Sibbald Elementary	3 Feb 1982 (2nd visit)	2-3	240
5	Medicine Hat School District, No. 76	Webster Niblock Elementary	30 Nov 1981	1-6	146
		Connaught Elementary	1 Dec 1981	1-6, Spec. Ed.	218
		Herald Elementary	1 Dec 1981	1-6	231
		Montreal Street Elementary	1 Dec. 1981	1-6, Spec. Ed	140
		River Heights Elementary	12 Jan 1982	1-6	210
		Crestwood Elementary	14 Jan 1982	1-6	365
		Crescent Heights Jr./Sr. High	15 Jan 1982	7-8	88
		Vincent Massey Elementary	19 Jan 1982	1-6	256
		Elm Street Elementary	20 Jan 1982	1-6	137
	TOTAL STUDENTS				4,478

Source: D. Stoker, Alberta Energy and Natural Resources

Support at the school level varied greatly depending on the interest in the subject area of individual principals and teachers.

The curriculum component does not appear to have been as successful as it might have been for the following reasons:

i) a lack of curriculum support materials;
ii) curriculum subject area overload;
iii) a lack of pre-planning and development time prior to implementation of the ENR activities;

Major gains in the implementation of energy conservation curriculum include:

i) Rocky View Energy Conservation Week;
ii) Medicine Hat Energy Conservation Curriculum Sub-Committee;
iii) Curriculum support material development by ENR.

SECTION 5

THE ENERGY CONSULTANTS' PERCEPTIONS AND ATTITUDES WORKSHOP

The zone energy consultants were one group whose perceptions of the energy conservation field project were important to obtain. They not only were the service delivery agents but they were participants in sponsorship acquisition on behalf of their respective areas of school jurisdictions. The energy consultants' perceptions were collected through six exercises that were conducted during a day long workshop. The workshop was a primary activity during the assignment process. The exercises that are listed in **Appendix E** consisted of the following:

1. Field Projects Background;
2. Perception of Energy Consultant Role/Function;
3. Description of Role/Function of Energy Committee;
4. Perception of Impact of Energy Conservation Field Project
5. Perception of Programme Objectives and Existing Guidelines Related to the Energy Consultant's Zone; and
6. Perceptions and Comments Regarding Administrative Procedures.

5.1 EXERCISE 1

Summary

Exercise 1, Field Projects Background provided an initial framework from which the energy consultants could discuss the status of the energy conservation field projects, individually and aggregated in their zone. A chronology of the process, a list of contact persons and comments regarding technical, motivational and curriculum aspects of the projects were requested. Finally a one word response regarding the perception of degree of success was requested.

The energy consultants indicated, individually and collectively, that they expended 90 - 95 percent of their effort on the technical retrofitting component. They expressed the general opinion that in this aspect of their assignment a wholly successful result had been achieved by this time in the programme, as noted in Table 5.1.

TABLE 5.1

PERCEPTIONS OF ENERGY CONSULTANTS REGARDING PHASE 2

	TECHNICAL COMPONENT	MOTIVATIONAL COMPONENT	CURRICULUM COMPONENT
ZONE 1	Wholly Successful	Moderately Successful	Moderately Unsuccessful
ZONE 2	Wholly Successful	Moderately Unsuccessful	Moderately Unsuccessful
ZONE 3	Wholly Successful	Wholly Successful	Wholly Successful
ZONE 4	Moderately Successful	Moderately Successful	Moderately Successful
ZONE 5	Wholly Successful	Wholly Successful	Wholly Successful

Source: Exercise 1, Energy Consultant Workshop
Stanley Associates Engineering Ltd.

Motivational and curriculum components were not viewed as an area in which the energy consultants perceived themselves to be wholly capable of addressing. Their general opinion was that a person with their background, e.g. an engineer, was not suited to provide motivation for teachers and students and it was difficult to encourage curriculum components regarding energy conservation. One of the energy consultants indicated that he was holding seminars with teachers and custodians to generate a working knowledge regarding the energy conservation features of the retrofits and a series of television programmes were in preparation.

Comments by Workshop Participants

The opinion expressed by the energy consultants of Zones 1 and 2 revealed that there were potential difficulties that had not been resolved to their satisfaction and it was focussed on the curriculum component. A variety of levels of satisfaction too was denoted by the energy consultants in terms of the motivation component.

The energy consultant in Zone 1 suggested that the custodians were main actors who must be allowed information to understand operational processes. BQRP applications were perceived to be unconditional and hence had to be maintained from the time of his predecessor. Further, difficulties arose due to demands placed by the three school boards.

The energy consultant in Zone 3 appeared to have delved into motivation programmes to a greater degree than all of the others. Seminars were prepared for teachers and custodians and "in services" on a monthly basis were prepared for custodians to inform them about energy conservation practices. Custodians were encouraged to undertake preventive maintenance (eg) weatherstripping. Energy and water consumption readings were collated weekly and presented to the principals to encourage their involvement. An examination for boiler maintenance was prepared. Finally, in-house television programmes were prepared by the Zone 3 energy consultant.

Comments presented by the energy consultant in Zone 4 included a concern for detailed terms of reference which should be prepared and acknowledged by the school board, the energy consultant and the sponsoring group. Costs for advanced techno-

logical equipment and labour values were considered to require research. Additionally lags in the retrofitting were encountered due to material shortages, (eg) thermostats created by a high demand by all zones.

The Zone 5 energy consultant noted that some technical problems were incurred, such as inadequate temperature settings about which some complaints from teachers were received by the principal. Communication between the teachers and the energy consultant was lacking which may have aggravated the complaints.

The supervisor to whom the energy consultants are subordinate identified that the 90 percent of the money, time and effort was expended on the technical component and that the degree of success could be noted only as moderate pending the conclusion of the Phase 2 project. There appears to be limited direction for motivation in terms of person-to-person contact through the energy consultant; however some measures to distribute information were attempted. They included the "showcase" schools displays and an audio-visual slide production with sound synchronization. Promotion of ideas regarding energy consciousness via the local media was considered adequate. Curriculum was promoted by the consultants but interest areas were highlighted through the work of Mr. Dan Stoker of Alberta Energy and Natural Resources.

Derivatives

The expression of 90 - 95 percent time allotment to the technical retrofitting component reinforces the limited committment of this project vis-a-vis the motivation and curriculum components. This perhaps acknowledges that a parallel stream of service in the curriculum component was devised by Alberta Energy and Natural Resources and hence allowed a reduced research and development effort by the zone energy consultants. The degree of committment to the motivation aspect appears to be conditional to the approach taken by the zone energy consultant; indeed the varied approaches taken by the energy consultants indicated a flexible programme.

5.2 EXERCISE 2

Summary

Exercise 2, Perception of Energy Consultant Role/Function, requested comments regarding the organization of the assignment from initiation to workshop date with reference to one typical and one exceptional retrofit assignment. Reporting procedures by the energy consultants' to their superior were requested. Additionally, an opportunity was provided to comment regarding proposed revisions to the role/function of the energy consultant, including perceptions of a potential implementing agency.

The energy consultants indicated that their initial endeavours were spent in achieving background knowledge regarding their field work (the test schools) and a work orientation regarding the Phase 2 field project.

Typical retrofit elements are noted in Table 5.2 and they consisted of night setbacks and timers. Exceptional retrofit projects are noted also in Table 5.2 and they ranged from electric controls with sensors to high pressure sodium lights. Insulation and building sealing were not noted as typical retrofit projects.

Reporting procedures to their supervisor required month-end statements that indicated scope and cost of work completed, as well as, future work envisaged. Informal discussions via telephone were also common between energy consultant and supervisor.

Comments by Workshop Participants

The supervisor of the energy consultants addressed the second exercise of the workshop from a project management perspective. This role requires contact with the zone consultants as well as reporting procedures to senior administrators in Alberta Education. Comments regarding areas of improvement to the role included:

i) less administrative loading and more technical duties;
ii) a focussed interactive role between other branches;
iii) enhanced performance evaluations; and,
iv) augmentation via increased technical aids/business machines.

TABLE 5.2
RETROFIT EXAMPLES - TYPICAL AND EXCEPTIONAL

	TYPICAL RETROFIT EXAMPLE	EXCEPTIONAL RETROFIT EXAMPLE
ZONE 1	Time clock system	Interlocked furnaces at Hines Creek High school
ZONE 2	Night setback system	Energy management system at Grand Centre High school
ZONE 3	Night setback system / Urinal water control system at Austin O'Brien School	Programmable controls at St. Boniface
ZONE 4	Night setback system	High pressure sodium lighting
ZONE 5	Seven-day timer controls at Connaught Elementary	Electric night setback at Montreal Street Elementary

Source: Exercise 2, Energy Consultants Workshop
Stanley Associates Engineering Ltd.

Suggestions for altering the role/function recommended by the zone consultants included eliminating the curriculum component and the motivation component, or as an alternative have other specialists deal with them.

Suggested revisions to their roles/functions included a decline in participation in motivational and curriculum components of the field projects, a greater use of computers in data manipulation and responsibility for new construction projects. The last point was viewed as sensitive by the engineers during the discussion period.

The engineers did suggest that generally any programme changes should be through Alberta Education.

Derivatives

The results of this exercise reinforced the energy consultants' uncomfortable feelings towards both curriculum and motivation components. It also denoted their own impressions of common retrofitting in the schools. The common technical features did not include standard practices of insulating and weather-proofing.

5.3 EXERCISE 3

Summary

Exercise 3, Description of Role/Function of Energy Committee provided an opportunity to comment about perceived evolution in form, commitment and thinking about the field projects and energy conservation matters. General details regarding the existing meetings and proposed alterations to the energy committees role/function were requested.

Most energy committees have been structured to include senior school district administrators, occasionally teachers and maintenance supervisors. The committees appeared to be organized for a top-down information dissemination.

The general note of the energy consultants was that the meetings had not been regularly held in all cases and had predominently been concerned with the technical component. The notion of energy conservation has been recognized in most instances to be important and the energy consultants perceived a continuing commitment to it as expressed by the energy committees.

Comments by Workshop Participants

Opinions regarding improvement of the structure of a zone committee were the following:

i) The Zones 1 and 3 energy consultants believed that custodial staff should be represented. Further, committees should exist in the planning stage and are not needed in the installation stage;

ii) The Zone 2 energy consultant believed that more representation should be acquired for the schools' staff (eg) principals, teachers and custodians. Meetings should be held monthly.

iii) The Zone 4 energy consultant stated that irregular meetings spaced at 3-4 month intervals would suffice. Urgent matters could be dealt with in an impromptu manner.

If alternatives could be included in a revamped approach, the energy consultants suggested that a change in Committee membership should be considered. Other staff members, such as teachers and custodians, should be present on the committee for the purpose of keeping discussions practical and allowing a feedback from the bottom up.

Derivatives

The results of the third exercise of the workshop revealed that a randomly structured committee with possibly informal meetings was creating impediments to information

dissemination and integration of all field project components. The main groups missing from the steering committees were principals and/or administrators, teachers and custodians at the school level, and lay persons.

Further, the energy consultants recognized potential deficiencies in the Steering Committees and suggested that they contain a full spectrum of personnel, possibly denoting that energy conservation is the responsibility of everyone involved with the school buildings.

5.4 EXERCISE 4

Summary

Exercise 4, Perception of Impact of Energy Conservation Field Projects, reflected the comment in Exercise 1 which described the degree of success of the field projects in each zone perceived by the energy consultants to workshop date. Details were asked for all recipients' reactions to the field projects and a description of obstacles, if encountered. General questions related to the field projects probed technical data availability, additional energy conservation projects that could be considered apart from existing ones and the perceived need to publish performance ratings.

Comments by Workshop Participants

The energy consultants consolidated their opinions regarding a high degree of success that was achieved in the technical component but moderate gains were noted for motivation and curriculum. The last item was noted, in one case, to be proportional to the interest expressed by the Board's curriculum consultant for the school. In the area of motivation, the energy consultants were vague regarding: potential activities; who should be motivated; and, to what degree.

The recipients of the field project effort are viewed by the energy consultants as reacting in proportion to their capability to understand the technical elements of the retrofits. Students, for example, were considered not to be capable of understanding

the retrofits and teachers were uninvolved until a problem occurred, say, in classroom temperature control. Maintenance staff appeared to have reacted favourably as long as additional work was not created for them. Senior administrative officials were perceived to be supportive and this allowed the consultants to "get on with their job".

Generally, the consultants believed that information feedback, specifically energy saved and the dollar equivalent, should be relayed to the recipients of the programme to ensure that a recognition is made of their efforts.

The supervisor of the energy consultants believed that the benefits (eg) the savings of energy, measured in monetary terms would be an adequate vehicle by which to convince individuals of the worth of the effort. Additionally, for those who are comfort oriented, it would be necessary to prove that the programme is not infringing on their comfort and rights.

One of the energy consultants suggested that the pay back period should be 7 - 8 years and not 2 - 3 years.

Derivatives

The energy consultants revealed, in this exercise, that the recipients of their motivation were unclearly defined collectively. This likely would impact on any measures generally directed towards this component.

Based on results of an earlier examination of motivation measures (eg) the Grande Prairie Public School District project completed in October 1979, for custodial staff common elements of scope, duration, frequency, target personnel and re-evaluation scopes could be identified. Target personnel would be all users of the school building as suppliers or acquirers of a community service.

5.5 EXERCISE 5

Summary

Exercise 5, Perceptions of Programme Objectives and Existing Guidelines as They Relate to Your Zone, probed for perceived difficulties in guideline usage and the attainment of limited objectives in the guidelines, as well as means to increase opportunities in meeting objectives. Comments regarding energy targets for retrofits and the rationale for any expressed standard were requested.

Comments by Workshop Participants

The energy consultants suggested that the guidelines are not adequate for their purposes. Some of them indicated that they had not used them. It would appear that they were used initially to start each retrofit programme but then abandoned. Each retrofit project was viewed as being unique and the generality of the guidelines made them redundant. The energy consultants suggested that at the end of the Phase 2 field project the tables in the back of the guidelines could be reworked using information retrieved from each zone. Their emphasis was on the technical component and not on the curriculum and motivational components, hence the energy consultants suggested they had not achieved basic guideline objectives in the latter items.

Noting that they are perceiving an existing value of 1500 $MJ/m^2/a$ in their schools on the average, the energy consultants believed that an average performance target of 1250 $MJ/m^2/a$ could be achieved within a year.

Derivatives

The response of the energy consultants to the existing guideline publication speaks favourably of them in the sense that any detailed conservation investigation will recognize its base value. The issue is perhaps one of audience and definitely one of detail. A very interesting question would probe the limit of utility of the guidelines to non-technical personnel using school buildings. Another would invite the format of a technical retrofitting manual that would introduce physical plant alterations as well as to program building-specific operating and maintenance activities.

5.6 EXERCISE 6

Summary

Exercise 6, Perception and Comments Regarding Administrative Procedures, aimed for responses to the existing BQRP and any other administrative procedures that were necessary to wholly implement the field projects. An opportunity was given to discuss difficulties encountered and to suggest amending measures.

The energy consultants stated five major criticisms of the BQRP and they were as follows:

i) long waiting periods for approvals (encountered during Spring peak);
ii) long financing periods creating additional costs of financing to the respective Boards;
iii) too low support levels, usually much less than maximum of 80 percent; and little or no inflation factors imbedded in the support formula;
iv) limited categories of qualification, (eg) microprocessors are not included for support; and,
v) approving administrators and inspectors may not be technically knowledgeable in energy controls.

Comments by Workshop Participants

The energy consultants also suggested that their submissions should be isolated from other applications and processed through a separate sponsor group or unit. It was the opinion of some that the paperwork involved with the BQRP application was dysfunctional and was an impediment to the administrators of school boards who did want to consider the program generally.

Other administrative suggestions involved the centralization of data for utilities consumption, project budgets, etc.

Derivatives

Changes in BQRP were the main notations by the consultants and they reflected a desire to see the alleviation of the aforementioned difficulties.

Three issues were generated by the energy consultants in the sixth exercise. They involved:

a. the degree of technical and professional responsibility given to field approval staff in the BQR Program;
b. BQR Program classification lags created by a new control technology; and,
c. the nature of existing BQR Program regulations and their impact on the use of the programme funds for a specialty area such as energy conservation. This precludes a discussion in which energy efficiency and general school building upgrading are ranked in a hierarchy based on conditions of health, safety, operating costs and comfort.

5.7 WORKSHOP DERIVATIVES

The workshop provided a forum in which the energy consultants and their supervisor were able to express their individual and collective opinions regarding the advantages and weaknesses in the service delivery aspects of the field projects. Clearly, the technical component was viewed as the most successful of the three components. By virtue of time expended and indeed money it was the heavyweight of the three. The zone energy consultants felt comfortable with the technical component but not with the motivation and curriculum components. The believed that their success generally was high only in the technical component.

Based on comments made by the zone energy consultants it appeared that energy committees that were formed in the regions were not formed with consistency and

their approach to information dissemination was arbitrary. Futher, their constituents were not patterned after an ideal or model scenario. Their common focus appeared to be the technical component.

The original guidelines, for those who were aware of energy conservation details, were considered technically sound, but basic. One derivative of the "50 school project" that was suggested by one energy consultant, was to rewrite the technical elements of the guidelines to conform to empirical data collected by the zone energy consultants. The motivation and learning experience components of the guidelines were not met fully during the course of the Phase 2 energy conservation field project.

BQRP funds added considerably to the extent of the expenditures by the various school boards. The zone energy consultants favoured the use of BQRP sponsorship for energy conservation projects but they denoted five areas of the programme which they believed were weaknesses. The areas were process and support classification oriented.

Finally, the energy consultants suggested that a centralization of information (eg) a data bank that would denote energy efficiencies in school buildings would be an advantage for analytical purposes later.

SECTION 6

ADMINISTRATORS' AND SCHOOL OFFICIALS' PERCEPTIONS AND ATTITUDES

6.1 THE SURVEY OF ADMINISTRATORS AND SCHOOL OFFICIALS

The main instrument of this assignment was an interview survey that was administered to senior school board personnel and school officials, all of whom were or had been involved with the energy conservation field project. Their areas of involvement ranged from zone Energy Steering Committee membership, Curriculum Sub-Committee membership, teaching staff who were information coordinators in their schools, through to principals whose schools were recipients of the field project.

The questionnaire screened by the Steering Committee for this assignment was designed to cover the major topics that were considered to appeal to all groups' interests. The questions noted in **Appendix F** enquired about the interviewee's:

(i) nature and degree of involvement in the field project;

(ii) perceptions of focus of the field project;

(iii) major positive and negative perceptions regarding the field project, the zone Energy Steering Committee, and the energy consultant;

(iv) perceptions and attitudes regarding the curriculum component;

(v) perceptions of utility of energy consumption standards and mechanisms for attainment;

(vi) perceptions and attitudes regarding the motivation component;

(vii) perceptions of the sponsorship processes available to the field project recipients; and,

(viii) opportunities to address through commentary and criticism any relevant and related matter pertaining to the field project.

Hence, the intention of the questionnaire was to estimate the nature of communications between all actors involved, to estimate the performance of some agents and service delivery mechanisms and to invite candid comments regarding observed strengths and weaknesses of the Phase 2 programme. The comments and criticisms have provided the foundation for report conclusions and recommendations.

6.2 SURVEY RESULTS

Sample Size

One hundred and one individuals were offered the opportunity to participate in the main survey, nine of whom were contacted for an appointment and then failing that by correspondence, as shown in Table 6.1. Ninety-eight surveys constitute the response sample. Thirty-two percent were senior administrators, 51 percent were principals, 14 percent were teachers and 3 percent were custodians, as identified in Question 1 of the Survey. The last group was a test sample. Thirty-eight of the respondents were members of energy steering committees.

TABLE 6.1

MAIN SURVEY - NUMBER OF RESPONDENTS

	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	TOTAL
Interviews in Person						
Administrators	10	5	3	4	6	28
Principals	8	11	9	10*	10*	48
Teachers	-	6	2	2	3	13
Custodians	2*	-	-	1	-	3
	20	22	14	17	19	92
Interviews via Mail						
Administrators	1	-	-	1	1	3
Principals	1*/**	-	-	-***	1	2
Teachers	-	-	-	1	-	1
Custodians	-	-	-	-	-	0
	2	0	0	2	2	6
Grand Totals	22	22	14	19	21	98

* Including the four multiple interviews that involved the vice-principals, principals and custodian staff. Two interviews included principals and custodians, hence the response base is taken as 97 persons. The custodian who was interviewed in Zone 4 is listed in the survey of custodians which follows.

** Two outstanding survey sheets

*** One outstanding survey sheet

Source: Stanley Associates Engineering Ltd.

Question 2

Issue: The second question asked whether the interviewee was presently involved in any other energy conservation activities, either professionally or personally.

Response: Forty-one percent of the respondents indicated that they were involved, mainly in terms of their residence.

Derivative: Although they were less in number than half of those interviewed, the respondents are involved to a significant proportion in energy conservation activities.

Question 3

Issue: The third question enquired about their agreement regarding the importance of developing energy conservation attitudes by Albertans.

Response: A significant majority of 86 percent answered in the affirmative.

Derivative: Twice the number of those who are active in energy conservation activities agreed that positive attitudes should be developed. This may suggest a future take-up rate in energy conserving programmes that may be directed towards the general public in Alberta.

Question 4

Issue: The emphasis of the field project was approached in the fourth question, one of multiple choice.

Response: About one-third of the responses indicated that both technical retrofits and motivation were emphasized. One quarter noted curriculum and about one quarter of the respondents were uncertain.

Derivative: The respondents on an aggregated basis are stating that they are not aware of the contents of the field project. The last two classifications (eg) curriculum and "uncertain" portray an event that was not adequately promoted. Conversely, the degree of uncertainty about what was a technical retrofit programme suggests that the beneficiaries of the activity could not assess its impact, nor its advantages to them.

Question 5

Issue: The fifth question was concerned with perceptions of highly positive and beneficial features of the energy conservation field project.

Response: The respondent was allowed to note as many answers as came to mind. Results are tabulated in Table 6.2. Four response groups emerged. The first group was 30 percent and above, the second group was 22 percent frequency of response, and the third group was 10-16 percent frequency of response. Responses fell dramatically for other answers and they comprise the fourth group. A miscellaneous classification was used and a 16 percent frequency of response constituted miscellaneous comments tabulated from **Appendix G.** Consciousness about energy conservation (30 percent) and the upgrading of the school buildings (31 percent) were main features. The availability of an energy consultant (22 percent) was also a high response. The availability of curriculum support materials (16 percent), comments that retrofits save money (15 percent), that information was gained (16 percent), that there were ECF project funds (12 percent) and a recognition of motivational measures (11 percent) were within the third group of responses.

Derivative: The energy conservation field project was different things to many respondents. This would tend to suggest either that the service delivery was versatile or that it had several advantages. This feature should be considered in marketing any future conservation programme. The smaller was the response, the less likely was the recognition that it was a significant programme feature.

TABLE 6.2

MAIN SURVEY RESULTS - MOST POSITIVE FEATURES OF THE FIELD PROJECT

What features of the energy conservation field project in your jurisdiction were most positive and beneficial from your perspective? (Multiple Choice Answering)

Selection	Number	%
The availability of ECF project funds	12	12%
BQRP funds were available	2	2%
The availability of an energy consultant	21	22%
School buildings were upgraded	30	31%
Retrofits save money	15	15%
Information was gained	16	16%
Consciousness about energy conservation	29	30%
Measures were available to conserve energy	0	0%
The Energy Bus was a good feature	5	5%
Motivational measures were noted	10	10%
Curriculum support material was available	16	16%
Nothing was most positive	5	5%
Other (miscellaneous comments, e.g. "Maintenance programs were upgraded," Technical control of environment," "Energy Day was superb," etc.)	15	15%
Response Base	97	

Source: Stanley Associates Engineering Ltd.

Question 6

Issue: Least beneficial and least positive features from the respondent's perspective were queried.

Response: Two frequency response groups prevailed and they were: (i) above 10 percent; and (ii) less than 10 percent, as shown in Table 6.3.

The most frequent response indicated complete satisfaction with the project by stating that nothing was "least positive" (16 percent). Difficulties encountered were noted as follows: start-up problems (11 percent), not enough technical retrofit measures (13 percent), lack of interest expressed in the topic by staff members (11 percent), and that there was a lack of satisfactory information (13 percent).

Further about 16 percent of the respondents indicated a miscellany of answers to this question, as noted in **Appendix G.**

Derivative: The responses to this question are directly applicable to logistical, operational and promotional components of the project. Any project extension should consider these responses to the difficulties encountered and adopt corrective measures.

Question 7

Issue: Positive contributions by the Energy Steering Committees were requested in Question 7.

Response: Generally there were two areas that were highlighted and they were:

i) the coordination of the field project at a local level; and
ii) the provision of information dissemination or exchange.

TABLE 6.3

MAIN SURVEY RESULTS - LEAST POSITIVE FEATURES OF THE FIELD PROJECT

What features of the energy conservation field project in your jurisdiction were least positive and the least beneficial from your perspective? (Multiple Choice Answering)

Selection	Number	%
Lack of satisfactory manual or guidebook	2	2%
Not enough project funds	1	1%
BQRP administrative procedures	3	3%
The activities/role of the energy consultant	0	0%
The Energy Steering Committee activities	0	0%
The Energy Steering Committee membership	0	0%
Complicated equipment	5	5%
Lack of satisfactory information	13	13%
Lack of interest in topic was expressed by staff members	11	11%
Not enough technical retrofit measures	13	13%
Not enough motivational measures	6	6%
Not enough curriculum measures	8	8%
Energy Bus activities	0	0%
Nothing was least positive	16	16%
Start up problems	11	11%
Other (Miscellaneous comments, e.g. "Principal was not consulted prior to retrofit," "No contact with principal," etc.)	16	16%
Response Base	97	

Source: Stanley Associates Engineering Ltd.

Respondents offered 53 comments and denoted support for the energy committee, an agent of change of attitudes towards energy conservation, and as expressed in Zone 5, the committee provided a good start to the project.

Derivative: The energy Steering Committees were viewed by most respondents as being advantageous for the field project. Advantages were noted in two manners: coordination and information dissemination.

Question 8

Issue: The reciprocal question to that above was the enquiry in Question 8 regarding the least positive aspect to the Energy Steering Committee.

Response: Comments expressing criticism or disfavourable opinions were offered in 33 cases and they could be classified into three groups. They followed the common themes of:

i) the duration and frequency allocated to each meeting may have deterred interest;
ii) a membership viewed as complete from the bottom-up was lacking; and
iii) vagueness regarding the Steering Committee's terms of reference, particularly with respect to establishing a priority system for the field project vis-a-vis other projects in each school jurisdiction.

Derivative: Clearly, any committee when formed should be provided attendant terms of reference that should include composition, responsibilities, functions and others.

Question 9

Issue: The activities of the energy consultant were probed in Questions 9 and 10 in order to decipher attributes and disadvantages respectively accruing through the role of the energy consultant.

Response: "Most beneficial" activities received 133 comments. All energy consultants were noted as specialists who were technically proficient and who maintained good professional credibility with the senior administrators and principals. There was some confusion in some instances at the teacher level as to who was the energy consultant. Where the energy consultant spent time in motivation efforts by providing information and personal contact, the respondents appear to have acknowledged the efforts as positive.

Derivative: The role of motivator appeared to be acknowledged by the programme recipients in spite of the limited content of the activity by the zone energy consultants. Their lack of persistence over the project period may have led to confusion in the roles of representatives of Alberta Energy and Natural Resources and Alberta Education.

Question 10

Issue: The disadvantages of the activities of the energy consultant were explored in Question 10.

Response: Only half as many comments to the positive responses conveyed messages of criticism, however most of them could be classified as communications related.

Derivative: Professional protocol contact opportunities and information conveyance may not have been part of a pre-field project orientation package for the energy consultants. Lack of attention to this detail may have had a harsh impact on principals, particularly those who subscribe to

communications protocol. The complex nature of some retrofittings may have frustrated some principals and teachers which were exacerbated by less than solid information sessions as perceived by the users of the retrofitted schools. Some comments reflected the limitation to curriculum and motivational materials, and professional jealousies may have been on the minds of some respondents.

Question 11

Issue: The utility of an energy steering committee and an energy consultant under a second start scenario was questioned in this part of the survey.

Response: Tabulations are noted in Table 6.4. Although response varied considerably within each zone, wholly the respondents in 60 percent of the cases inferred that they would want to have an energy steering committee. About 80 percent of respondents indicated that an energy consultant would be useful in a future endeavour.

Derivative: Three of every five respondents would favour the use of an energy steering committee in a future project. The ratio is higher, four of every five in the case of favouring the use of an energy consultant in a future project.

TABLE 6.4

MAIN SURVEY RESULTS - FUTURE USE OF ENERGY STEERING COMMITTEES AND ENERGY CONSULTANTS

	Energy Steering Committees	Energy Consultants
Percent yes	60%	80%
Percent no	6%	8%
Percent uncertain	27%	10%
Percent no response	7%	2%
Response Base	96	95

Rounding has occurred.

Source: Stanley Associates Engineering Ltd.

Question 12 and 17

Issue: The issue probed in Question 12 was the promotion of a recognized energy consumption standard for each school building within a school jurisdiction. Furthering this thought later in the interview questionnaire, the respondent was asked to comment in Question 17 about the use of an energy consumption performance standard and operating cost formulas in Provincial Regulations.

Response: Several comments were obtained in both questions. A summary is presented in Table 6.5. More than two-thirds of the administrators who were interviewed indicated favour towards both parameters, and nearly 50 percent of the principals echoed their sentiments. Mixed reaction occurred in 28 percent of both the administrators' and principals' responses. None of the administrators responses were wholly negative but 6 percent expressed varying degrees of uncertainty. Sixteen percent

of the principals did express some uncertainty; however about half of that number indicated disfavour with the concepts.

TABLE 6.5

MAIN SURVEY RESULTS -

ENERGY CONSUMPTION AND REGULATED PERFORMANCE STANDARDS

All Zones	Wholly Positive	Wholly Negative	Mixed Reaction	Express Degree of Uncertainty	Sample Size
Administrators	68%	0%	26%	6%	31
Principals	48%	8%	28%	16%	50

Source: Stanley Associates Engineering Ltd.

Derivative: An energy standard that would be a performance standard and one that could be tied into a regulatory policy would be supported by 68 percent of the administrators and 48 percent of the principals interviewed in the study area.

Question 13

Issue: Should energy conservation consciousness be part of the curriculum (course) content in most grades?

Response: More than 90 percent of all respondents in all zones indicated a positive reaction to encouraging this theme.

Derivative: The use of the direct and indirect opportunities found in the Curricula Guides warrants further review in the future.

Question 14

Issue: An enquiry into the extension of energy conservation features was the content of Question 14.

Response: Answers in all three cases indicated that the programme would not be sustained at the same rate once the field project concluded. About 40 percent of all respondents believed that the curriculum component would be sustained and 26 percent indicated that it was their understanding that staff motivation would continue. Only 22 percent of the respondents believed that the technical retrofitting component would continue beyond the field project.

Derivative: The impact of the energy conservation field project sponsorship has been implicitly revealed and has been significant. Future endeavours of information/programme sponsorship should be considered.

Question 15

Issue A "model" energy conservation demonstration project was queried.

Response: Nearly 40 percent of respondents on the average in all zones could not name an energy conservation field project that was a 'model' or 'demonstration' project, as shown in Table 6.6. Further 20 percent of the respondents did not consider any example appropriate of the designation. Those that did name an example did not recognize wholly the showcase schools in their zones.

TABLE 6.6

DEMONSTRATION (SHOWCASE) SCHOOLS

Date of Open House	Zone	School Name
17 March 1982	4	Springbank High School
25 March 1982	2	Fort Kent School
2 April 1982	1	St. Thomas More School
13 April 1982	3	Austin O'Brien High School
5 May 1982	5	Connaught Elementary School

Source: Alberta Education

Derivative: A high proportion of respondents did not acknowledge the correct location of a showcase school or demonstration project in their regions. This warrants futher promotional activity.

Question 16

Issue: The derived value of the field project was queried.

Response: About 87 percent of all respondents answered in the affirmative that the energy conservation field project had been worthwhile.

Derivative: It was considered to be a successful project by nearly all of the respondents.

Question 18

Issue: The degree of satisfaction with the project grant allocations was explored in Question 18.

Response: About 50 percent of those who were involved with the sponsorship and who responded to the question indicated that they favoured the level of sponsorship. Fifteen percent of the respondents were not pleased and 35 percent were uncertain.

Derivative: The sponsorship of the field project suited half of the respondents and it was indeed gratefully acknowledged by them.

Question 19

Issue: The BQRP process was questioned. About 32 persons interviewed denoted that they were familiar with the BQRP process.

Response: About 25 persons (80 percent) who indicated familiarity with the BQRP application procedures denoted that it was not a simple procedure.

Derivative: The impact of misunderstanding the application process should be assessed, as well as alternative restoration project approval mechanisms.

Question 20

Issue: Question 20 enquired about how future energy consultant services should be provided.

Response: Slightly more than half (52 percent) of all respondents indicated that services should be retained in the public sector. Nine percent of the respondents favoured a change to the private sector and 39 percent were uncertain, as shown in Table 6.7.

TABLE 6.7

MAIN SURVEY RESULTS -

OPINIONS ON FUTURE ENERGY CONSULTANT SERVICE BASE

Zones	Retain in Public Sector	Supply from Private Sector	Uncertain Response
1	17	0	5
2	9	1	12
3	6	2	6
4	5	2	11
5	13	4	3
All Zones	38	9	37
%	52%	9%	39%

Source: Stanley Associates Engineering Ltd.

Derivative: This may be an expression of satisfaction with technical performance regarding the overall project.

Question 21

Issue: The role of the energy consultant in a curriculum support activity was questioned.

Response: Nearly 75 percent of all respondents indicated that the zone energy consultant should contribute by providing curriculum support materials.

Derivative: Apparently a market for this service exists and Alberta Education may wish to explore it, as well as determine what activities are required by the zone energy consultant to fulfill the support role.

Question 22

Issue: The role of the energy consultant in a motivation component was questioned.

Response: About 84 percent of all respondents noted that the energy consultant should contribute by providing guidance for staff motivation.

Derivative: Motivation is one area that Alberta Education may wish to clarify and bolster for the energy consultants.

Questions 23 and 24

Responses to Questions 23 and 24 are displayed in **Appendix G** along with general comments to other questions. The responses to Questions 23 and 24 have been aggregated into subject areas such as:

(i) Energy Consultant;
(ii) Curriculum;
(iii) Motivation;
(iv) Technical;
(v) Economics and Financing;
(vi) Communications;
(vii) Follow-up Activities;
(viii) Other issues; and,
(ix) Assessment of project success.

All comments are dissected by respondent classification and by zone.

6.3 DERIVATIVES

A total of 103 persons had participated in 98 interviews that were prepared to obtain perceptions, attitudes and comments regarding the energy conservation field project in the five zones of the study area. Virtually everyone was interested enough in the subject to afford the time to answer the twenty-four questions on the survey but also to provide candid comments that required more than 90 pages of appendix to record.

More than 30 percent of the sample base were administrators, and more than 50 percent were principals. Nearly 40 percent of the respondents stated that they were members of energy steering committees.

More than 40 percent of all respondents were involved with other energy conservation activities either personally or professionally, and slightly less than 90 percent of all respondents stated that Albertans should develop energy conserving attitudes. This would suggest that a significant portion of the respondent sample is prepared to accommodate energy conservation and about half of them already have made some commitments.

The technical retrofit component and the motivation component were most frequently judged to be the contents of the field project. The most beneficial aspects of the field project were considered to be the upgrading of school buildings and the new consciousness of energy conservation. The highest response of least positive characteristics was that "nothing" about the project was "least positive". Some concerns were expressed that there were not enough technical retrofit measures and that there was a lack of satisfactory information.

The energy steering committees were viewed generally as having been advantageous by coordinating the project at the local level and in their information dissemination. Problems encountered and denoted as least positive aspects to the energy steering committees included an inconsistent membership structure and the lack of a terms of reference for the committees' operations and mandate. About 60 percent of all respondents stated that an energy steering committee would be appropriate for a future project.

The energy consultants were considered to be technically proficient but there was some confusion by teachers regarding who was their energy consultant. Additionally the energy consultants received criticism concerning business protocol measures in schools. Regardless, about 80 percent of all respondents indicated that they would use the services of an energy consultant in a future project. Slightly more than half of the respondents suggested that the energy consultant services should be retained in the public sector. The role of the energy consultant was viewed by 75 percent of all respondents as being a provider of curriculum support materials and nearly 85 percent of all respondents stated that the role contain a mechanism to support staff motivation.

The notion of an energy consumption performance standard for each school building and one that would be regulated by Provincial government policy was supported by about 70 percent of all administrators and about 50 percent of all principals interviewed in the study area.

Energy conservation content in the curriculum was supported by more than 90 percent of all respondents, and perhaps via indirect references.

Major extensions of the three components of the project were not being considered by most respondents.

A significant portion (60 percent) of all of the respondents were not able to state the name and location of the demonstration schools in their zone, or they did not perceive that there was something of that nature to be recognized.

The project was viewed by nearly 90 percent of all respondents as having been a success and about 50 percent of those respondents who were involved with the sponsorship element of the project were satisfied with the level of sponsorship. One of the fund acquisition mechanisms, the BQRP was viewed by 80 percent of those who were familiar with it as being a difficult process.

SECTION 7

SCHOOL CUSTODIANS PERCEPTIONS AND ATTITUDES

The school custodians comprised the second largest group of interviewees in this assignment. Their interests in the field project were based on their requirement to cope with an alteration to their working environment in terms of technological innovations and in some cases awareness of existing features of the physical plant, particularly in terms of operations regarding conservation efficiency.

A separate survey was conducted for the purpose of having the custodians describe their own difficulties encountered during the field project and to determine to what degree initial programme problems were recalled. The separate survey was designed following a small test sample of four custodians during the main survey.

7.1 THE SURVEY OF CUSTODIANS

On June 21 and 22, a telephone survey of school custodians was carried out to determine their perceptions of the energy conservation retrofit programme. Thirty-nine of a possible fifty-one custodians were asked a series of five questions. These questions were as follows:

i) Were you working at the school when the energy conservation retrofitting program was in preparation?

ii) What advantages do you perceive with the energy conservation retrofits in your school?

iii) Have you found that there were any problems for you during the energy conservation retrofit program?

iv) Was the energy consultant helpful to you?

v) If the energy conservation retrofit programme was repeated at your school, what changes would you suggest to make the adjustment easier for you?

7.2 SURVEY RESULTS

Tabulated features of the survey are noted in Table 7.1. Only two custodians noted that they were not working at their schools when the energy conservation retrofits were in preparation.

Responses to Questions 2 through 4 are tabulated in Table 7.2 and include the 35 custodians who were interviewed by telephone. The survey was designed to obtain responses other than one word answers should additional detail be required; however, the data have been prepared to reflect positive and negative responses.

Generally, about 70 percent of the custodians perceived that advantages were accruing to their schools due to the retrofits. Negative replies were received only in Zone 4. Less than 15 percent of the custodians indicated that they did not know whether advantages had been sustained. The advantages of the energy conservation retrofits perceived by the custodians included saving money and energy. The placement of automatic controls in schools to allow the boilers to shut down early in the evening and start up early in the morning was perceived as a benefit in all zones. One school district indicated that this practice had been maintained manually for several years prior to the field project.

More than half of the custodians (54 percent) in all five zones observed problems during the retrofitting programme duration. Custodians in zones 3 and 4 perceived difficulties at the ratio of 2:1 or greater. Complaints about the temperatures in schools were received in Zones 1, 2, 4 and 5. Problems most often mentioned were related to the perception that retrofits were installed improperly or were functioning incorrectly.

There was some mention that it took more time to go around and shut things off. More difficulties were perceived in Zone 4, as several custodians felt equipment was not functioning adequately. Custodians in Zone 5 commented that the schools were too cold first thing in the morning.

Generally, the energy consultants were perceived as being very helpful in explaining what they were doing, how the equipment worked and taking care of problems associated with retrofits.

TABLE 7.1

SURVEY OF CUSTODIANS - SAMPLE BASE AND QUESTION 1 RESPONSES

	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	TOTAL All ZONES
CUSTODIANS SAMPLE BASE						
Interviewed by telephone	7	8*	7	6	7	35
(Interviewed in Person)	(2)	--	--	(1)	--	(3)
Not Available/No Response	1	3	2	4	3	13
	10	11	9	11	10	51
QUESTION 1						
WORKING AT SCHOOL DURING RETROFITTING						
- complete duration	8	8	6	5	6	33
- partial duration				1	1	2
Not working at school during retrofitting			1	1		2

* Two custodians were interviewed in one Grande Centre School group.

Source: Stanley Associates Engineering Ltd.

TABLE 7.2
SURVEY OF CUSTODIANS - RESPONSES TO QUESTIONS 2, 3 AND 4

QUESTION 2 ADVANTAGES PERCEIVED TO RETROFITS IN THEIR SCHOOL	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ALL ZONES	%
Positive Response	5	4	6	4	5	24	69%
Negative Response				2		2	5%
Neutral Response (Uncertain)		1				1	3%
Work Incomplete		1			2	3	9%
Did Not Know	2	2	1			5	14%
QUESTION 3 **PROBLEMS PERCEIVED DURING RETROFITTING PROGRAMME**							
Problems Were Perceived	1	3	5	4	3	16	46%
Problems Were Not Perceived	6	5	2	2	4	19	54%
QUESTION 4 **HELP PROVIDED BY THE ENERGY CONSULTANT**							
Yes	6	6	6		7	25	71%
No		1	1	1		3	9%
Did Not Meet Energy Consultant	1	1	—	5	—	7	20%
Sample	7	8	7	6	7	35	100%

Source: Stanley Associates Engineering Ltd.

The custodians did believe that the energy consultant was helpful in more than 70 percent of the cases. Zone 4 was the only zone in which nearly all of the custodians indicated that they did not meet the energy consultant, and their number was the majority that comprised the 20 percent value on Table 7.2.

Custodians in Zone 3 believed that the seminars that were given were good and made the changes easier to understand. The custodians had some suggestions which they believed would have made adjustments to the energy conservation programme easier. Constructive criticism and suggestions were not received from Zone 1, because everyone stated that the programme was working well. A suggestion that someone should oversee the retrofits to make sure that they were completed properly was made in Zone 2. Custodians from Zone 3 had several comments including suggestions that the retrofits should be undertaken wholly rather than have contractors return frequently; that they should have more involvement; that there should be meetings involving all staff affected by the programme; and that there should be fewer manual controls in order to reduce their work load. Several custodians in Zone 4 felt that there should be more interaction between the energy consultant and the custodian. One custodian stated that the school should be carefully observed before and after the retrofits to ensure that the new system is indeed an improvement. Another custodian believed that contractors installing new equipment should stay on the job for a few days to ensure that the equipment is functioning properly. One custodian in Zone 5 felt that removing brand new 40 watt light bulbs and replacing them with new 34 watt bulbs was extremely wasteful.

7.3 DERIVATIVES

The custodians, by virtue of their daily operations are an important group with which to have contact during the retrofitting programme. In the one zone in which the custodians did not meet the energy consultant, there were negative responses to the question that requested perceived advantages. They are a group that requires continuous information and motivation possibly through meetings and/or seminars directed at their area of work. Various programmes may be available to them via centres of technical training.

SECTION 8

BUILDING QUALITY RESTORATION PROGRAM

8.1 ACQUISITION PROCESS FOR BQRP

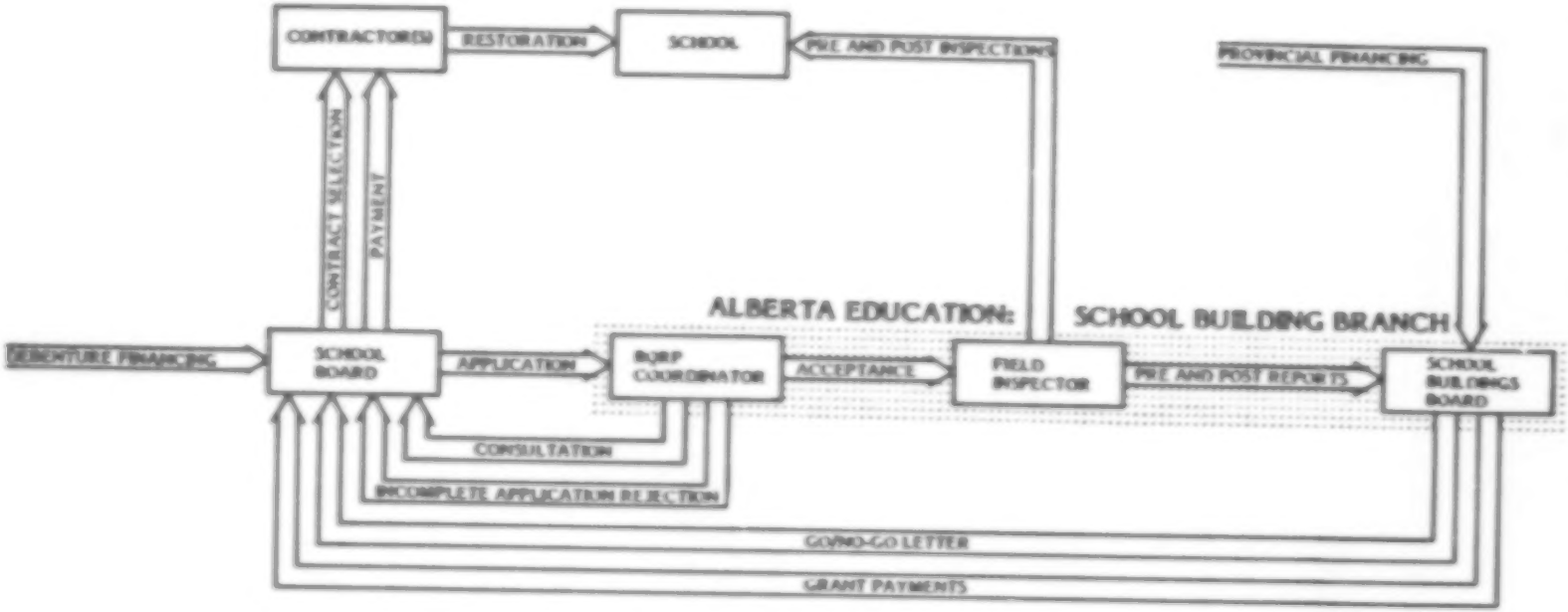
The BQRP acquisition process, shown in Figure 4, requires that the school board prepare and submit a fully documented application to the School Buildings Branch of Alberta Education. The application is screened for content completion and is further processed through visitation to the school by a field inspector. If the project is rejected at either of these stages it is returned to the applicant pending further information. If the project clears these two stages, a report is forwarded to the School Buildings Board recommending for the proposed project and providing background for the School Buildings Board decision. The School Board is informed when approval is given, and the work may then proceed. Tendering is required for work over $50,000. When completed, a second field inspection is made, a report is generated and if the work is found to be satisfactory, funds are transferred to the School Board. Ideally the application approval process time should be 2 - 4 weeks except during peak volume periods in the spring. The use of the BQRP sponsorship could maximize expenditures at 80 percent of approved support for energy conservation projects.

8.2 ENERGY CONSERVATION DETAILS OF BQRP

The BQRP directly supports energy conservation measures to the extent noted in Table 8.1. Energy conservation is one of the objectives of the BQRP and is one of the programme categories. Energy conservation is supported also in other project categories such as: structural, roof, windows and glass block, as well as electrical.

One may evaluate the BQRP with respect to energy conservation features in the following manner:

i) Some support is available for energy conserving retrofit work in school buildings;



BQRP COORDINATOR: Reviews applications for completeness and correctness.

BQRP FIELD INSPECTOR: Knowledgeable construction personnel to field inspect projects and submit reports.

SCHOOL BUILDINGS BOARD: Meets once per week.

FIGURE 4: Building Quality Restoration Program Process Chart

Stanley

TABLE 8.1
BUILDING QUALITY RESTORATION PROGRAM
ENERGY CONSERVATION ASPECTS

OBJECTIVES

Replacing or adding to components which will result in Energy Conservation and subsequent cost savings. Discretion must be used when comparing replacement or improvement costs versus potential school life energy cost savings.

CATEGORIES OF PROJECTS

Structural

I. Roof

Replacement of entire or major part of a membrane and damaged insulation because of failure - not patching or repairs. A consultant report on roofing conditions must be included in a submission. Supported items include:

- Additional roof insultation to to R-12* (in conjunction with roof replacement).
- Additional roof insultation over R-12* (in conjunction with roof replacement and accompanied by an Engineer's report on Roof Load).

II. Windows and Glass Block

Replaced or blocked out because of failure of major components or of demonstrable excessive solar heating or heat loss.

III. Energy Conservation Factors

- Insulation in attics
- Additional insulation in exterior walls
- Provision of vestibule enclosures to include two sets of doors.
- Replacement/new insultation on domestic hot water pipes.
- Heating equipment, duct and/or piping insulation.
- Installation of water savers on toilets, sinks and urinals.
- Installation of additional day/night set back control thermostats
- Additional thermostats and control valves (for selective heat distribution)
- Installation of automatic controls such as electric or mechanical time clock switches.
- Installation of damper controls.
- Individual room light switching.
- Automatic controls for air circulation fans, temperature, exhaust and electrical services (light switching, etc.).
- Installation of outdoor temperature sensors.
- Replacement of existing lighting with energy efficient lighting.
- Installation of capacitors.
- Installation of time control clocks for car plugs.

ELECTRICAL

I. Replacement of obsolete fluorescent fixtures.

Source: Building Quality Restoration Program 1981, School Buildings Administration, Alberta Education.

ii) The support categories are limited and may require additions to include advancing technology (eg) micro-processors that monitor and regulate high energy using systems;

iii) There appears not to be a formulation within the BQRP guidelines which offers a measurement of the cost effectiveness of the energy conserving retrofit work. The existing guidelines appears to base support on the age of the school building. This may be inherent to the definition of "restoration" in the programme name; and

(iv) Energy conservation appears as a distinct category and not one that is imbedded in every other support category. This allows the situation were school boards can restore their stock of school buildings through upgrading projects involving mechanical and electrical systems, modernization, and aesthetics, without concern for energy conservation.

Taking the above points (ii), (iii), and (iv) in reverse order what implications are there if alterations in the programme were to occur?

Should the objectives of energy conservation be a high priority, it would require that all restoration projects would have to incorporate into their design, selected energy conservation criteria that would be dually related to mechanical and electrical systems, equipment and building envelope. This would require that a set of guidelines would be developed in order to provide the selected design criteria.

Projects could be assessed according to an energy conservation criteria based on such variables as climate, age of school, type of construction and HVAC systems, energy source, and facility utilization. For example, approval of an aesthetic upgrading project on the exterior elevations of a school would require meeting certain energy conservation criteria. These criteria could be based on either prescribed energy use performance standards or insulation values.

The inclusion of an economic return formulation such as a benefit-cost assessment, could be one of the guidelines. It could require that an energy audit procedure be

implemented on the building as a base information set. Further, the inclusion in the BQRP of specified payback periods would provide a standard application of energy conservation criteria. The payback periods should be based on forecasted energy savings and hence cost savings.

Finally, the advances incurred in the guidelines would require that new technologies be acknowledged and be included as options that could be explored for energy conserving restoration projects.

8.3 COMMENTS BY ZONE ENERGY CONSULTANTS

The main comments about the BQRP voiced by the zone energy consultants are summarized from Section 5. They suggested that:

(i) There are long payback periods in which support monies are provided to the school boards;
(ii) The general level of support values is less than the maximum;
(iii) There appears not to be automatic inflation factors assigned to support values;
(iv) There are limitations to the support categories in terms of technologic advances; and,
(v) approval agents may not be technically knowledgeable about energy controls.

8.4 COMMENTS BY FIELD PROJECT RECIPIENTS

The levels of sponsorship provided by the BQRP were well received however a number of criticisms were made of the BQRP application process by field project recipients. These criticisms can be classified into four areas as follows:

i) inspection procedures;
ii) relationship between the energy conservation field project and BQRP;

iii) compatibility between the BQRP and board level maintenance programmes; and,

iv) accountability procedures.

The interviews with project recipients generated comments that are representative of the above criticisms. Inspection procedures are perceived to create delays in project approvals. A specific instance was cited where an inspector would not look at broken equipment in a school because the paper work was not processed in Edmonton, creating the need for another trip to that particular school.

The existing relationship between the energy conservation field project and the BQRP was perceived to create problems in terms of increasing the paper work for the energy consultants and delaying the field projects.

In certain jurisdictions it was perceived that the objectives of the BQRP were not compatible with those of board level preventative maintenance programmes. It was perceived that the project requirements generated by a preventative maintenance programme do not fit wholly within BQRP guidelines. This discrepency makes administration of such a programme awkward from the point of view of fund acquisition.

A concern voiced regarding current BQRP guidelines is that they could create a haphazard add-on approach to maintenance based on 80-cent dollars instead of a preventive maintenance approach based on local needs.

Accountability procedures were considered to be too complex by a majority of respondents directly involved with them, especially for the smaller projects, although some form of accountability was generally recognized as being required. The general perception was that there is too much paper work involved for the degree of sponsorship at the low value end of the project size scale.

The project recipients were provided with an opportunity to suggest alterations to the BQR Program. In response to their above noted criticisms, the following suggestions

were made by the respondents as measures to improve the BQRP administration procedures:

i) Applications for BQRP projects during a given fiscal year should be allowed to be processed during the fall of the preceding fiscal year, to eliminate peak application delays;

ii) BQRP funding should be given to the school districts as a block grant, based on a percentage of the assessed value of building stock. Two percent of the assessed school building value per year was suggested as a reasonable sponsorship level;

iii) BQRP regulations should give allocations for consulting services;

iv) Funding should be provided prior to project initiation;

v) The BQRP funding process should be simplified by giving school boards funding on a per student basis;

vi) On school modernization projects, the requirements for architects adds to the total project cost due to fees. Also architects tend to be extravagant in their designs. Maintenance supervisors should have more direct controls over this category of projects;

vii) Independent BQRP inspectors are unnecessary due to the fact that expertise exists at the board level, for example the maintenance supervisor;

viii) The pre-approval of small BQRP projects should be eliminated. Small projects were defined as those under $5,000;

ix) Projects under $5,000 in scale should be spot checked;

x) Grant approvals should be automatic for projects similar to those carried out previously in schools of the same age and type;

xi) Fund projects on a school by school basis rather than on a project by project basis;

xii) A post-audit system should be instituted where the project is completed before the grant is requisitioned;

xiii) A system of differential regulations should be instituted. Accredited preventive maintenance programmes should receive funding for a five year period while non-accreditted programmes should receive funding project-by-project. This approach would have the inherent incentive for school districts to development preventative maintenance programmes through

the streamlining of the approval process. Another form of differential regulation would be to relate the degree of accountability with the scale of project;

xiv) The energy consultants should have BQRP inspections authority on all energy conservation projects; and

xv) Increase the number of building inspectors.

8.5 SURVEY OF BQRP ENERGY CONSERVATION PROJECT RECIPIENTS

8.5.1 The Survey Form

The survey of BQRP energy conservation project recipients was an option to the main survey selected by the steering committee. The survey form is noted in **Appendix H.** The intent of this survey was to determine the variations in the extent of energy conservation retrofits, staff motivation, and success between the projects undertaken in association with the field projects and those undertaken independently. These comparisions comprise one means by which to judge the success of the field project in the promotion of energy conservation. In addition to these comparisons the survey was used to explore commentary on the BQRP application process.

The summary was conducted by telephone with senior school board administrators who were familiar with the BQRP in those jurisdications which had applied for BQRP funds under the energy conservation category. They are:

i) The Fort McMurray Roman Catholic Separate School District, No. 32.

ii) St. Paul School District No. 2228

iii) County of Beaver, No. 9

Administrators for the Fort McMurray Roman Catholic Separate School District, No. 32 were not available for comment. In addition to the above noted school jurisdictions, administrators from the following jurisdictions who have not yet accessed BQRP funds but who were associated with the St. Paul School District, No. 2228 energy project were also interviewed. They were:

i) St. Paul Regional School District, No.1

ii) Glen Avon Protestant Separate School District, No. 3

Persons contacted during this survey are noted in **Appendix J.**

8.5.2 Responses

The energy conservation projects that accessed BQRP funds directly were motivated by the high cost of energy. Projects consisted of car plug-in temperature sensors, air circulation fans in gynasiums and window closures. Most items were not part of more extensive projects, (ie) modernization, aesthetic upgrading, but were approached as separate items. The exceptions were the window closures, which were done in conjunction with the upgrading of mechanical systems. These projects were essentially directed to reduce peak power demands and reduce power bills. They included in all instances the motivational components of turning off lights. The motivation component included a 100 percent rebate system for energy saved in the County of Beaver School Board No. 9.

The projects were conducted without the benefit of school energy audits or cost benefit analysis. Their preliminary estimates of savings were prepared with the assistance of a number of agencies including private consultants, utility companies and in one instance a 'borrowed' Alberta Education field project energy consultant. One administrator noted that knowledge of energy conservation practices was gained through an Alberta Education sponsored seminar conducted by a utility company individual a few years ago.

Those respondents who were familiar with the extent of energy conservation projects funded by BQRP perceived that there were not any deficiences in this category of projects. Fifty percent of the respondents perceived the BQRP application process not to be a simple procedure, but some responses to this question included comments that the process had improved considerably. Problems associated with BQRP were noted as follows:

i) delays in approval for projects timed for the summer peak period were noted as a consistent problem, a situation perceived to be a result of a lack of inspectors;
ii) too much paper work for small projects;
iii) expertise was not available in small districts to fulfill application requirements;
iv) short term loan structure for project between $50,000 and $100,000; and,
v) funding allocation depreciation formula for newer buildings is a disincentive to proceed with some energy conservation projects.

Suggestions regarding implementing an energy conservation programme were made as follows:

i) an energy consultant is a good approach;
ii) energy conservation should be approached on a jurisdiction wide basis, not on the current piecemeal approach;
iii) smaller boards need help to implement, (ie). the use of energy consultants and training for custodians; and,
iv) the leadership should be taken by Alberta Education.

It was reported that the BORP energy conservation projects that proceeded received 80 percent funding from the BORP.

Comments regarding the success of the BQRP funding energy conservation projects are as follows:

i) projects were good, but not very extensive;
ii) the whole endeavor was very frustrating due to lack of local resources; and
iii) a minimum success was achieved in motivation due to apathy among staff.

8.5.3 Survey Conclusions

The conclusions regarding the BQRP energy conservation projects are as follows;

i) the projects represent the rudimentary beginnings to an energy conservation programme in the jurisdictions involved, based on the need to reduce energy costs;

ii) the efforts have been frustrated by the lack of a comprehensive approach and local expertise; and,

iii) the interest expressed by the administrators involved in the energy conservation projects created an atmosphere in which these jurisdictions are ripe for further involvement.

8.6 DERIVATIVES

The present BQRP will end in 1983. Should there by any consideration for an extension, the perceptions and opinions expressed above are noteworthy and suggest areas for programme review and research. The issues to be considered are:

i) Although BQRP received unfavourable comments in terms of programme delivery procedure, the degree of project sponsorship was welcomed because it fulfilled a need for upgrading school building stock to meet code and learning environment standards. Additionally it was viewed to reduce maintenance and operating costs. BQRP seems to be fulfilling a need, and continuation of the programme should in part be based on assessment of that need.

ii) Further integration of energy conservation within the BQRP framework will depend on Alberta Education's commitment to making energy conservation mandatory in all restoration projects that affect energy use. There are two options available:

   a) leave energy conservation essentially as a separate category of BQRP allowing other catagories of projects to proceed independently of energy conservation considerations; and,

   b) integrate energy conservation, with and use it as a criterion for assessing other categories of projects;

iii) The BQRP administration procedure appears awkward and should be reviewed. Time requirements for inspection, administration and fund allocation procedures should be determined for case studies using type and value of projects as classifications.

SECTION 9

SUMMARY AND CONCLUSIONS

The summary and conclusions contained in this section have been prepared from the major derivatives of the foregoing text and they reflect the issues that were defined as research decision points. The study objectives are used as a format for reporting in this section. Re-ordered for convenience, they are the following:

Objective 1

To look at the current status of technical retrofits, motivational and student involvement programmes in each zone to determine if there were weaknesses and areas for improvement;

Objective 2

To discover whether the objectives of the Phase 2 project were realistic and attainable;

The objectives of the Phase 2 project were:

i) To test the generalizability of the energy conservation measures outlined in **Guidelines for Conserving Energy in Alberta Schools** and augment these guidelines as required;
ii) To develop standards of energy consumption for Alberta schools by school type and size and on the basis of climate; and
iii) To provide lighthouse projects that are readily accessible by personnel from surrounding jurisdictions.

Objective 3

To judge whether the processes chosen for completing the objectives were appropriate;

Objective 4

To decide whether the human and financial resources provided for the project were adequate;

Objective 5

To develop conclusions and recommendations that are designed to provide direction for a Province-wide energy conservation programme for schools.

9.1 CURRENT STATUS OF THE ENERGY CONSERVATION FIELD PROJECTS

9.1.1 The Technical Component

Most recipients of the programme, as well as the suppliers of the services leading to technical retrofits, were in agreement that the retrofits were warranted, were necessary to reduce energy consumption and therefore were worthwhile investments.

Technical Service Delivery

Most of the energy consultants rated this aspect of their assignment satisfying due to the degree of perceived success. Recipients of the service believed generally that they had acquired good service from their respective energy consultant. Most custodians and some principals believed that poor communications between the energy consultant and themselves interfered with a maximum transfer of information and ideas.

The Energy Bus (mobile audit) service was a peripheral element to this issue due to its limited duration in the project. A cross-reference to the services provided by the Energy Bus and the energy consultants has not been established.

9.1.2 The Motivation Component

This was perceived to be an area of moderate success and one that required adjustments by both energy consultant and recipients alike, (eg) school principals and teachers. A major effort in all zones aimed at motivating energy conservation in schools has not been introduced nor maintained.

Motivational Activities

Efforts by the energy consultants were varied, but those who provided detailed motivation techniques, such as in Zone 3, where the teachers' working environments were improved and where in-services were held, believed that a measure of success was gained. An indirect motivational effort appeared to be the informal liaison between the energy consultants and the staff and students. The presence of the consultants in the schools, the fact that work was being done, and the consultant's enthusiasm raised the curiosity of staff and students. The energy consultants apparently were able to respond informally to enquiries. Also the fact that the project occurred, positively affected attitudes of some school users towards energy use.

Curriculum support materials appeared to have a positive effect on student attitudes. Those materials with a project orientation which had students interact directly with their school environments, doing activities such as meter reading and energy snooping were good. More than one respondent noted that when he left an office or classroom with the lights on the students would turn off the lights and leave a reprimanding note.

The rebate system that was implemented in the Medicine Hat School District No. 76 through its Energy Conservation Plan generally was well received because school personnel gained direct and tangible rewards for their energy conservation efforts. However, two criticisms of that programme were voiced by the respondents:

i) The rebate system penalized those schools in which energy conservation had been practiced previous to project implementation, since energy consumption would be lower than it otherwise would have been in the preceding 36 month base period.

ii) A question was raised regarding the long term effectiveness of a rebate system. What happens to this type of measure when all the energy is being saved that realistically can be saved? Will energy use start to rise once rebates are no longer obtainable, or will the wise use of energy be engendered sufficiently that the conserver lifestyle prevails?

Notwithstanding the above-noted criticisms, a system whereby school users receive direct benefits for their efforts to conserve energy, appears to be a positive feature at least as an initial measure. The Medicine Hat example, or some form of school based budgetting, are two potential means to implement a direct reward system.

Motivation Disincentives

Certain aspects of the project had a negative effect on staff and students and on the promotion of energy conserving attitudes. These general problems could be divided into the following categories:

i) Communications
ii) Motivation Problems Created by Retrofit Deficiencies
iii) Teacher Support Deficiencies

(i) Communications

The following specific examples were noted by respondents as communication problems:

a) a lack of information dissemination regarding the when, what and why of the required retrofits;
b) school staff and teachers often felt left out of the decision making process regarding quality of environment issues within their schools.

The lack of information dissemination resulted in misconceptions regarding the intent of the project. For example, in Medicine Hat a decision was made to replace the 40 watt fluorescent lights with 34 watt tubes, coupled with a 3 year replacement cycle. Staff and teachers were not informed why this change was to occur and what benefit would result from it. The light available from fluorescent tubes decreases with age, and while the existing tubes were being replaced by ones with lower wattage, the actual amount of light available was being increased. Although this replacement program was a benefit to teachers and students through increased lighting levels, it was perceived that the lighting levels were decreased and the replacement of existing tubes was creating tremendous waste. The communication problem that resulted in this misconception created negative feelings towards the programme, such as: why should school staff and students accept a decrease in the quality of the teaching environment in the name of energy conservation while tremendous waste is being incurred?

School staff and teachers felt left out of the project when they were not supplied enough information regarding retrofits, and were not involved in the decision making process so had a negative feeling towards the project. For example, often the timing of renovations was not discussed with staff prior to being carried out, which resulted in some disruption of classes. There was a general feeling that if staff and teachers are consulted in the decision making process and are involved and informed they will be more tolerant of problems when they occur.

Criticisms regarding communication deficiencies were aimed at both the Energy Steering Committees and the Energy Consultants. The membership makeup of the Energy Steering Committees was often perceived as being a major source of the problem, especially when principals and teachers were not included as committee members. This resulted in a situation where formal lines of communication between the committee and the schools involved were not established.

Energy consultants were criticized on primarily two accounts with respect to communication. It was suggested by one respondent that the consultants should have been prepared by Alberta Education in the communication and educational aspects of the project (eg.) they should have been instructed on how to communicate in a manner akin to what teachers believe is professionally representative of their practices.

(ii) Motivation Problems Created by Retrofit Deficiencies

The most general problem with the technical retrofits centered around the installation of automatic controls. The automatic controls were perceived to be inflexible to changes in school use. Often no one in the school knew how to override the automatic controls or change them. This resulted in some situations where the school was in use after regular hours while it was very cold.

Often the automatic controls were installed during the coldest part of the year. This resulted in severe inconvenience, in some instances, while the "bugs" were being worked out of the system. It was suggested that the automatic controls should be installed in the summer and the "bugs" ironed out before the commencement of cold weather.

Automatic controls were not perceived to work well in schools where the original HVAC system or the the building envelope was of poor quality. Comments suggested that some classrooms were cold or poorly ventilated. These problems were judged to stem from poorly designed or installed HVAC systems, from schools that had open areas that were altered to form classrooms, and from schools that were not sufficiently insulated, (e.g.) concrete block buildings. It was suggested that automatic controls would only work well if combined with a proper insulation program.

One criticism of automatic controls was that the money spent on them would have been better spent on upgrading original poor quality HVAC systems.

The above perceptions and comments raise the question regarding the degree to which energy conservation retrotfits should be integrated in a general modernization programme for any school building.

There was often the perception that 'real problems' in the schools were not being addressed by the field projects. For example, insulation was not being upgraded and leaky windows and doors were not being replaced in some schools. This resulted in motivational problems (eg) in some instances it was perceived that the building was so energy inefficient that turning off lights and other motivation measures would not make much difference to the energy consumption pattern of the school.

A number of people mentioned that increasing the payback period for the project to five and even ten years would allow buildings with serious insulation and equipment problems to be upgraded.

(iii) Teacher Support Deficiencies

The curriculum component was not perceived to be a high priority of the project and some school districts apparently decided not to invest teacher time in development and implementation of energy curriculum materials. A request by teachers for a day long workshop to discuss implementation was not granted by their Board in one instance. This had a negative motivational effect on these teachers.

9.1.3 The Curriculum Component

Energy consultants and recipients of the field project alike believed that the curriculum component was only a moderate success in spite of the work by the Energy Conservation Branch of Alberta Energy and Natural Resources.

The curriculum component from the perspective of those involved in the project at the school and school district level of the project in general was not perceived to be as

successful as it might have been. Reasons for this perceived lack of success as well as areas in which there were substantial gains are noted below:

Lack of Curriculum Support Materials

ENR produced, collected for distribution or located 30 curriculum support items that were distributed or brought to the attention of liaison teachers. Teachers, principals and administrators believed that there was a lack of curriculum support materials. This perception was common. They further believed that it is not the responsiblity of teachers to develop these materials and this may have reinforced opinions that energy conservation via classroom demonstrations was of limited importance. A notable exception was the initiative taken in the Medicine Hat School District through an Energy Conservation Curriculum Committee that developed local curriculum support materials. Was the perceived lack of support materials attributed to information dissemination problems or an actual deficiency in materials? Curriculum support materials were developed but some administrators noted that obtaining them was difficult.

It was noted in some schools that the energy conservation liaison teachers provided good energy conservation programmes in their classrooms but transfer to other teachers was minimal.

Energy Conservation in the Curricula Guides

There was mixed reaction regarding the extent to which energy conservation is supported in the Alberta Education **Curricula Guides.** There are distinct areas in which it could be considered to be supported but they may have yet to be recognized.

Curriculum Component Implementation Procedure

The perceived need by ENR personnel to parallel the technical component in the first year with curriculum activity in the field leads to a situation where curriculum was promoted prior to pre-planning and development of support materials. This situation was not to the full benefit of the field project because it did not afford a comprehensive and fully coordinated approach to this component.

Curriculum Overload

The majority of teachers and principals indicated that the curriculum was already "too full". It was suggested that energy conservation should not become a subject in itself but be incorporated into other subject areas. Suggested examples include; science, social studies, language arts, economics and mathematics.

Curriculum Gains

Gains were acquired in this area and it appears ripe for review. The Rocky View Energy Conservation Week and the Medicine Hat Energy Conservation Curriculum Sub-Committee, as well as curriculum support materials developed by ENR were major contributors to this component, and could provide models for further endeavours in this area of an activity.

Rocky View Energy Conservation Week

The energy conservation week appears to be a good model to promote energy conservation in the elementary grades. Reaction of principals and teachers involved in this project was extremely positive both in terms of process and results. Particularily noteworthy comments were itemized previously.

As noted in **Appendix D (Page 4)**, the staff and student reaction to the energy conservation week in Rocky View were generally noted as being very positive and was compared to the interest level achieved for the pollution studies undertaken by students a number of years ago. There was a feeling that consciousness had definitely been raised.

Medicine Hat School District Energy Conservation Curriculum Committee

The Medicine Hat School District Energy Conservation Curriculum Committee appears to be a good model for development of locally generated curriculum support materials. It is an exception to the more endemic situation in the school districts surveyed where the lack of curriculum support materials was noted as a major reason why energy conservation was not instructed.

One criticism voiced by participants in the curriculum committee is that involvement should include student release time and not strictly involve extra time after class.

Curriculum Support Material Development

The curriculum material developed by ENR and curriculum support materials developed elsewhere in North America were collected, itemized and some cases were distributed to project schools. "Neat ideas" that might be useful for student involvement in curricular and motivational activities were compiled through meetings with the teacher representatives of most project schools. An annotated bibliography of these materials is noted in **Appendix C (Pages 6-8, 12-27).**

9.1.4 Respondents' Curriculum Suggestions

Some interesting suggestions regarding instruction of energy conservation in schools are noted below:

i) Some respondents believed that energy conservation could be best incorporated into the elementary school curriculum. Students at this age are more likely to be introduced to the conserver ethic. Energy conservation could be included in junior and senior high school but not in every grade;

ii) A course that would increase the understanding of buildings and HVAC systems would be valuable for custodians;

iii) Energy conservation should be part of a broader based consumer education; and,

iv) The instruction of energy conservation should be extended to adults through night school courses.

9.1.5 The Energy Steering Committees

Informality in meeting logistics, as well as limited membership in some energy committees, reduced information dissemination from supplier to user of the service delivered. In some instances the committee membership may have isolated itself from some information opportunities, (eg) feedback from the bottom up.

9.1.6 Energy Consultants

The majority of respondents who voiced an opinion on this subject should like to see the energy consultant remain in the public sector. The existing model was perceived to be very workable. A public sector employee could provide the extra services in support for curriculum and motivation that could not be provided through the private sector. An important aspect to hiring public sector energy consultants should be to standardize the approaches to the energy conservation problems as well as provide an information exchange and a pooling of resources. Also it was indicated that in a number of areas it was hard to acquire this type of expertise especially in rural areas.

9.1.7 The Original Guidelines Publication

The **Guidelines for Conserving Energy in Alberta Schools** publication was little used by the energy consultants on the grounds that is was too elementary for their purposes, although utilized many of the retrofit ideas contained in them. The Guidelines were not tested by the energy consultant from a user's perception. An advanced publication has not been produced. Energy conservation information appears to be just at the threshold of public consumption. The main survey related to this report revealed that significant numbers of respondents are concerned about the subject; however far more are concerned than those who are implementing energy conservation measures outside the Energy Conservation Field Projects. The Guidelines published by Alberta Education may have been premature for wide public consumption. Its content, however appears sound based on the responses of knowledgeable individuals who have reviewed the approximately 4000 copies that have been distributed. The Guidelines may be well received by a greater number of persons should they be reintroduced, possibly repackaged and supported by technical findings of the Energy Conservation Field Projects.

9.1.8 Energy Conservation Standards and Regulations

There was a full range of response regarding instituting the standards and regulations to promote energy conservation in the Province. A number of people supported the concept, however there was considerable concern regarding the ability to have a

standard for retrofits given the variety in age of the buildings, construction techniques, HVAC systems, fuels, community use and climate. It was suggested that guidelines be developed rather than standards. The use of standards and implementing them through regulations was supported for new construction. Most people felt that Alberta Education should take the lead in this area with regulations and sponsorship because it was felt that school boards would not implement energy conservation in new buildings due to the due to capital costs involved.

Performance standards were noted to be good idea but there was opposition to implementing them through regulations due to the fact that program standards imposed through funding mechanisms creates complex regulations due to the controls imposed by the Auditor General's Office for accountability in proving the standard was indeed met. An alternative approach was suggested to regulations and that is to provide a consulting service and "sell" the idea of paybacks from energy savings to the school boards.

Another suggested approach to the implementation of standards was to make them part of the regular upgrading of buildings, and base then on the building standards (i.e. R-values) and not on energy use. For example, when replacing a roof, the insulation should be upgraded to the minimum standard. This approach would circumvent the difficulty of implementing an energy consumption standard in existing buildings.

9.2 CONCLUSIONS TO THE RESEARCH DECISION POINTS

A response to each research decision point or grouping is contained below:

(a) How do the general programme contents of the publication **Guidelines for Conserving Energy in Alberta Schools** compare to programmes in selected Canadian and Northern U.S. jurisdictions?

The literature search revealed that the above-mentioned publication is a summary statement of technical, motivation and programming components that can be developed by both school board and school administrators/maintenance staff. The

publication appears elementary for individuals who are trained in energy conservation measures (eg) Phase 2 Energy Conservation Field Project consultants and yet had severe difficulties in implementation by lay-persons. The contents of the publication could be used in some circumstances in other public buildings, commercial applications and in simplified versions - residential buildings. There were two publications in British Columbia that appeared after the Alberta Guidelines. The Alberta materials appeared to be more detailed as a solitary entity and encompass more space.

(b) What components of the programme are utilized in each retrofit school example and what components are ignored?

The technical retrofit component augmented by automatic controls was the primary focus of the programme. The motivational component and curriculum component were not ignored in the Phase 2 project but were not fully realized, in spite of interests expressed and acivities undertaken by Alberta Energy and Natural Resources.

(c) Are the roles of the energy consultants consistent and effective in the five zones?

(d) What is the perceived role of the energy consultant by sponsoring agency, recipient school and the energy consultants?

The roles of the energy consultants throughout the five zones were consistent in terms of implied mandate. Functions and activities that would define the role were not consistent through the following items:

- each energy consultant had relative liberty in selecting the nature of energy conservation procedures and measures;
- energy consultants were allowed freedom to proceed with certain technical retrofits that they believed would have maximum impact.

The administrators viewed the energy consultants as being advantageous to the project from start to finish. The principals, teachers and custodial staff mainly perceived the energy consultants as being effective in the provision of technical procedures related to the retrofittings. However, there was some concern regarding the capability of the

energy consultants to provide curriculum materials, staff motivation and general information to the custodial staff. Indeed the energy consultants themselves identified weaknesses in the motivational and curriculum components through their roles throughout the course of the Phase 2 project.

(e) What monitoring has been on-going in terms of energy use by each school and are the roles of the Energy Committees consistent and effective?

The monitoring of the project has been twofold and has partially included this assignment in which perceptions and attitudes were requisitioned. Additionally technical monitoring has occurred throughout the energy conservation field project and has included meter readings, the Energy Bus and the assessment of building efficiency once the retrofits have been in place.

The roles of the energy steering committees were approximately consistent, based on the provision of decisions regarding technical retrofit procedures. The energy steering committees were not as effective as they could have been, due to the informal nature of the meetings and committee structure. Information transmission, both from the bottom up and the top down was inhibited due to gaps in the committee structure. Some Boards did not give decision-making powers to the committees.

(f) What costs are incurred for each retrofit including capital and operating costs to supply the service?

(g) What is the cost share, and how is this perceived by sponsor and recipient?

This study addressed capital costs only, however, operating costs in terms of salaries and disbursements are important items for a complete economic evaluation of the impact of the Phase 2 Energy Conservation Field Project. Further cost shares have been defined in terms of direct project grant, BQRP sponsorship and direct payments by the recipient school board. Additional costs included publications and personnel from Alberta Energy and Natural Resources. Generally the recipient school boards were delighted with the acquisition of the direct project grant and sought to augment the process considerably by the investment and acquisition of BQRP monies. The

capital cost shares of the technical component, the curriculum component and the motivation component do not lend themselves to comparison. The technical component was viewed as capital intensive and the others were viewed as labour intensive by the sponsors.

(h) What application procedures for the BQRP are perceived to be suitable/unsuitable by the field test schools and the few schools who have independently acquired BQRP sponsorship for energy conservation purposes?

The BQRP application procedure was not perceived to be a simple procedure by most of the respondents who were familiar with it. The pre- and post-inspection procedures were perceived to unduly delay projects during spring peak processing periods for the summer construction period. It was felt that directly associating the energy conservation field projects with the BQRP application/inspection procedure created unnecessary complexity and delay. One solution to this problem may be to grant inspection responsibility for the energy conservation field projects funded through BQRP to the energy consultants.

(i) Are the arbitrary standards of energy use and payback for retrofit reasonable, currently and over the payback period?

(j) At what point should the standards alter and how will this impact upon the schools already retrofitted and the remainder throughout the Province?

The perception of most school board administrators, principals and teachers indicated that energy consumption standards could be defined acceptably for each school building in the zone and based on certain formula using criteria which could be implemented through provincial regulation as performance measures. Key factors would be a reward system for the individual conserving schools, sophistication in the formulas that would address annual alterations of climatic conditions and differences in the school building, energy supply and nature of use in buildings (eg) community use.

(k) Will the mode of providing energy consultants be realistic within the realm of the public sector should the field project be extended to all existing schools in Alberta?

Most respondents suggested that future services should be provided through energy consultants retained within the realm of the public sector. Some senior administrators suggested that a time sharing, and hence, cost sharing basis between several small boards could be a key opportunity to providing this expertise to all the boards throughout the province.

(l) To what degree could and should an energy conservation programme be included in the School Building Regulations?

This research decision point was reconsidered as: should energy consumption performance standards be part of provincial regulations? An energy conservation programme utilized in some school buildings throughout the Province is contained within the BQRP. The sections of the programme are limited and do not address,for example, micro-processing units used to control heating and ventilating systems in the schools. The positive response provided by senior administrators, principals and teachers to provincial regulation of performance standards would suggest that there is indeed an opportunity to imbed an energy conservation programmes within provincial regulations. This would be a senior level policy decision that would require additional investigation.

(m) Are students, teachers and staff reacting in daily circumstances to energy conservation curricula when they are present in the retrofit field test schools?

There was some evidence of extra-programme involvement in energy conservation either via the home or elsewhere. Few schools appeared to have distinct displays regarding energy conservation messages at the time the survey was conducted.

(n) Has a list of "energy dog" schools been assembled in the jurisdiction involved in the field tests and across the Province for the purpose of noting a potential expansion programme and priority sheet?

A list has not been prepared by Alberta Education.

(o) Through the recipients of the BQRP funds for retrofit, what demonstration mechanisms would be reasonable to encourage an expansion of the retrofit programme?

The difference in the extent to which energy conservation projects were pursued between field project recipients and those for which BQRP funds were accessed independently was substantial. This indicated that the field project had a significant impact in terms of the extent energy conservation was promoted through the BQRP. The field projects thus seemed to be an appropriate mechanism to promote energy conservation.

9.3 WERE THE OBJECTIVES REALISTIC AND ATTAINABLE?

The degree of success that is met in attaining certain objectives depends on their acceptance by all groups. Viewed by the suppliers of the services, the degree of success can be weighed against the resources that must be committed to achieve the objectives. Viewed by the recipients of the services, success is achieved when their own positive expectations are met (eg) when an alteration appears to be of benefit to them.

The benefit can be assigned a physical, emotional, economic or informational characteristic. A physical characteristic would be related to a changed environment (eg) a retrofitting that creates a better workplace. An emotional characteristic could be the sense of achievement in conveying new material through the classroom medium, or the sense of greater well-being in having a more confortable environment. An economic characteristic would be the achievement of creating a cost savings in energy consumption whereas, an informational characteristic would be related to the acquisition of knowledge that would be of personal or professional benefit.

The degree of success achieved by the project in the opinion of both suppliers and recipents is the key measurement in this qualitative evaluation.

The technical side of energy conservation as described in the **Guidelines for Conserving Energy in Alberta Schools** were met. The energy consultants, the resident experts believed that the publication contents were basic and that the result of the energy conservation field project would enhance the materials contained in the publication. Further, with proper professional service the recipient school jurisdiction would achieve easily the energy conservation intent of the publication. The recipients of the project and service provided by Alberta Education acknowledged generally that good success had been achieved in the technical component. There were exceptions to the general opinion as one may expect due to existing circumstances in some school buildings.

The energy consultants believed that given sufficient time to recover energy consumption information, it would be possible to generate an energy performance standard for the test school buildings. They concluded in the workshop that 1250 $MJ/m^2/a$ would be a reasonable target figure for all schools tested, but that variations would occur due to school location. Of course, many factors would have to be taken into account. The notion of having an energy performance standard for each school and one that would be guided by Provincial regulations was acceptable to most administrators and principals interviewed, assuming that conditional qualifications were met.

The initial attempts to demonstrate energy conservation in the lighthouse projects were not a large success. Considerably more information dissemination and promotion will be required prior to a public viewing. Personnel in surrounding jurisdictions currently may not be informed about the comprehensive treatment that is part of the energy conserving efforts provided by Alberta Education in the showcase schools. The demonstration projects undoubtedly benefited from project sponsorship rather than BORP funds solely. This point will require attention in future information to surrounding jurisdications.

Summarizing, the objectives were realistic and they were attained. Future success will depend on the nature of promotion and further research.

Curriculum support materials were welcomed but were viewed as being inconsistently delivered. Those teachers who were involved with energy conservation favoured

additional materials. The degree of utility will be related to the nature of the implementation of policy that has imbedded energy conservation in the Curricula Guides.

The assignments that were given to the energy consultants allowed a degree of flexibility, that is, each zone appeared to have a programme different to all others. This must be recognized in any analysis of the appropriateness of the programmes. The flexibility appears to have allowed a multitude of technical alterations to be included in the retrofits. Resolving the economic benefits of each type by individual school building should be carefully considered prior to an extention of the energy conservation service.

9.4 WERE THE PROCESSES APPROPRIATE AND WERE THE RESOURCE ADEQUATE?

The processes selected for completing the objectives included:

i) financial support via direct project grants, BQR Program and others;
ii) energy consultants in each zone;
iii) energy steering committees in each zone;
iv) motivation materials;
v) curriculum support materials by Alberta Energy and Natural Resources; and,
vi) flexibiity in programming.

Financial support through both the direct project funds and the BQRP was acknowledged to be substantial and acceptable.

The zone energy consultants were perceived to be proficient in the technical requirements but not as proficient in the other two components. The percent response denoting that energy consultants would be used in the future implies that they were considered adequate.

The energy steering committees were viewed as necessary groups to provide local input, however their mandate, composition and some logistical elements appeared to have shortfalls that are worthy of reflection. Motivation, through materials, information and training sessions, and personal contact, by the energy consultants was limited but has been recognized as part of the project by some recipients. Further reviews of strategy and implementation measures are warranted.

SECTION 10

RECOMMENDATIONS

Generally three elements should be considered and they are:

i) internal organization to coordinate energy conservation in school buildings;
ii) further research; and
iii) implementation procedures following phase II.

(i) Integration of the Energy Conservation Thrust within Alberta Education

Even delivery of service for the technical, motivational and curriculum components of an expanded energy conservation field project will depend on application of a unified thrust within Alberta Education. Activities and philosophical orientation towards energy conservation should be coordinated between the Branches within the Department. An appropriate mechanism to coordinate Alberta Education's energy conservation thrust is required.

(ii) Research Directions

Building Quality Restoration Program

The BQRP should be reviewed to assess whether or not it is an appropriate delivery vehicle for upgrading a school building's energy consumption performance. The review should include the following items:

i) the policy objective that energy conservation should be a criterion in all school building restoration projects;
ii) the appropriateness of including computerized energy management systems as a project category;
iii) the appropriateness of including pay back periods for energy conservation retrofits sponsored by BQRP;

iv) the investigation of alternatives of granting funds for approval on a project-by-project basis, including preventive maintenance programmes and block sponsorship.

Integration of High Technology into Schools

The introduction of high technology into school buildings creates two issues. The first is the school user and operator interface with computerized control systems. Motivational disencentives may result if controls are not responsive to changes in user needs. Expertise of custodial staff may be taxed if controls are too complex. The second issue is the integration of computer systems that are used in energy management with those used for security and education functions. Further research is required regarding application of high technology in schools. Research orientation should include the following:

i) the degree of system centralization;
ii) the level of training required for the human resources component;
iii) the degree of integration of energy management operations and educational functions in school buildings; and
iv) the appropriate level of application.

Revitalized Information Package

A reintroduction of the **Guidelines for Conserving Energy in Alberta Schools** may be warranted in the future due to growing interests in energy use by the public. The scope and packaging to meet the needs of specific interest groups, (ie) custodians, teachers and administrators should be explored.

The Curricula Guides

This preliminary investigation touched on the aspect of energy conservation within the **Curricula Guides.** It revealed the extent to which the **Curricula Guides** supported the curriculum component of the energy conservation field projects. A number of issues must be raised regarding further research in this area.

Alberta Education should investigate further the relationships between the **Curricula Guides** and the curriculum component for a future extension of the Energy Conservation Field Project. This investigation should determine:

a) objectives for any extended energy conservation curriculum component. A central question regarding the objectives is focus, recalling that the current objective is to "engender students involvement in the task of conserving energy in their classroom and their school." A revised objective could be a central focus of promoting the wise use of energy in society;

b) the degree to which energy conservation is supported in the **Curricula Guides** and its sufficiency in terms of requirements of an extended energy conservation field project. Any deficiencies and their remedy should be noted.

Curriculum Support Materials

Concern about the availability of curriculum support materials in the energy conservation subject area was expressed by respondents . This concern may be representative of an actual deficiency in energy conservation curriculum support materials, or a perceived lack of these materials resulting from a communications gap.

Alberta Education should investigate the need for energy conservation curriculum support materials to fulfill the objectives of the curriculum component. This investigation should determine the following:

a) the extent and nature of the need, by grade, by subject strand and by type of unit;

b) the best means to make teachers aware of the availability of energy conservation curriculum support materials;

c) the best mechanism by which to develop materials, (i.e.) Curriculum Branch Alberta Education; district level committees; other government agencies; and the private sector.

(iii) Implementation of Additional Projects

Scale

Criteria to determine the appropriate scale of additional projects need to be established. Potential criteria by which to make this assessment are:

i) School Selection by Energy Use
Energy performance values for schools would be assessed in terms of type of construction and HVAC system(s), use profile, and climatic zone. These values will represent a relative weighting of energy consumption and the need to retrofit each school. A priority retrofit programme may then be established based on the relative potential for energy savings.

ii) Length of Payback Period
The payback period used in Phase 2 to amortize capital expediture with energy cost savings was under five years. This short payback period has the advantage of a quick return on investment, and the disadvantage of leaving unrectified significant energy consumption deficiencies in some schools. Longer payback periods may increase the fiscal magnitude per school. Certain categories of retrofit projects such as building envelope upgrading may be justified if carried out in conjunction with other types of school restoration projects (eg) modernization and aesthetic upgrading.

Maximum Testing in Selected Schools

Test schools, at least one in each zone should be selected for a maximum energy conservation effort. They should be given a maxi-audit through both the Energy Bus and the efforts of the zone energy consultant. Staff and student motivation measures should be planned and implemented. Maximum technical retrofits should be provided to reduce the energy wastage. This will provide a base line by which to measure performance of a combined programme, leading to an ultimate energy consumption standard for the respective school buildlings.

A comparative analysis using economic feasibility criteria such as a total life cycle analysis, a net benefits (net surveys) approach, an internal rate of return analysis, a discounted payback analysis, or cash flow analysis should be made to assess economic trade-offs and the achievement of certain energy performance standards. This will be a prototypical model by which to derive potential performance standards and test criteria. The test period should be at least one calendar year and should include at least two maxi-audits per school (before and after retrofits) from the Energy Bus, as well as several spot checks by the energy consultant.

Enhanced Information, Motivation and Promotion Efforts

The results of the assignment revealed that there are opportunities to increase the influence of a conserver ethic and Alberta Education can play a significant role through:

a) augmenting the technical activities of the energy consultants by hiring a resource person with whom teachers will feel more comfortable;

b) coordinating more showcase school demonstrations and campaigning heavily ahead of time. The message can be useful if sent to the general public;

c) providing a mechanism whereby schools will gain direct financial benefit if energy is saved;

d) providing training programmes for all users of school buildings, demonstrating through case studies and theory how energy consumption can be reduced. This can be structured to include specialists as guest lecturers and speakers, and could be organized through one or more of the Province's technical colleges; and,

e) maintaining a motivation programme aimed at the school and school administration, teacher, custodian, student, student family, and school neighbourhood and community.